



**THE ADVANCED HEALTH CARE SYSTEM THROUGH THE USE OF BIG DATA
IMPLEMENTATION FOR BANGLADESHI HOSPITAL**

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Master of Science
in
Software Engineering
by

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This is to certify that this dissertation work entitled

**THE ADVANCED HEALTH CARE SYSTEM THROUGH THE USE OF BIG DATA
IMPLEMENTATION FOR BANGLADESHI HOSPITAL**

is a bonafide record of the work done

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CERTIFICATE

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Signature of the Guide

DEDICATION

This research I would like to dedicate to my Family. Without their love and support it would be impossible for me to be in this stage of education. I also like to dedicate to all my friends; the best friends, close friends and foreign friends who have been with me in this journey so far.

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ABSTRACT

Big Data is a relatively new concept which has revolutionized the way we analyze and interpret information. It consists of data which are too big and too cumbersome to store, transport or analyze by the usual means. With each passing day as we accumulate more data, it challenges us to think of and create next generation storage along with tools and techniques to analyze the data. In terms of the medical use of these Big Data tools and technologies, the foremost advantage that it provides is the access to a huge array of information on different cases and remedies regarding multitudes of maladies and their treatments within the comfort of a physician's home or office. The Big Data technologies and techniques allow us to join related information together and in finding correlation in that information enabling us to enrich the knowledgebase and providing real-time support by analyzing the patient's medical histories in light of the information in the knowledgebase, allowing easier diagnosis and treatment. While it helps, us treat and analyze individual cases and their pathological states, it doesn't lose sight of the bigger picture and also allows us to find the trends in diseases or health risks in a particular area or age group or gender while not losing sight of the short-term evolution of the disease or the condition of the patients. Maintaining Big Data is more challenging than a traditional database, thus it requires specialized technologies and techniques to address the sheer volume. The patient expenditures are analyzed by Map Reduce while Apache HIVE is used to record the pathological state of an individual patient derived from multitudes of medical reports thus providing access to information and its analysis instantly. Here, the main objective of Big Data is to suggest a precise course of action and to do so swiftly. This paper intends to address the importance of using Big Data technologies and techniques in context to the healthcare infrastructure of Bangladesh, providing the hospitals and physicians an organized means to quickly respond to cases while reducing the expenditures and mortality rates in doing so.

Keywords: Big data, Analytics, Healthcare, Framework, Methodology.

[Table of Contents](#)

FTMS COLLEGE	2
CERTIFICATE	3
DEDICATION	4
ACKNOWLEDGEMENT	5
ABSTRACT	6
LIST OF FIGURES	10
LIST OF ABBREVIATIONS	11
CHAPTER 1	12
1.0 INTRODUCTION	12
1.1 AIMS	14
1.2 OBJECTIVES	14
1.3 PROBLEM DEFINITION	14
1.4 JUSTIFICATION	15
1.5 PROJECT LIMITATIONS	15
1.6 RESEARCH QUESTIONS	16
1.7 RATIONALES	17
CHAPTER 2: LITERATURE REVIEW	18
2.0 BACKGROUND OF STUDY	18
2.1 BIG DATA TECHNOLOGIES	19
2.2 BACKGROUND STUDY OF DHAKA MEDICAL COLLEGE	20
2.3 DESCRIPTION OF HOSPITAL	21
2.4 BIG DATA ANALYSIS IN HEALTHCARE	21
2.5 BENEFITS TO HEALTHCARE	22
2.6 ARCHITECTURAL DESIGN	24
2.7 USE OF MAPREDUCE ALGORITHM	26
2.8 COMPARISON BETWEEN EXISTING SYSTEM AND NEW SYSTEM	27
2.9 SOFTWARE SPECIFICATION	28
CHAPTER 3. METHODOLOGY CONSIDERATION	30
3.0 INTRODUCTION	30
3.1 RESEARCH METHODOLOGY	30
3.2 DEVELOPMENT METHODOLOGY	31
3.3 TYPE OF RESEARCH	32
3.4 INTERVIEW	32

3.5	ANALYTICS AND DATA MINING	33
3.6	DATA COLLECTION	33
3.7	SYSTEM AND TECHNOLOGY	33
3.2	DAYNAMIC SYSTEM DEVELOPMENT SYSTEM (DSDM)	35
3.3	FEATURE DRIVEN DEVELOPMENT (FDD)	37
3.5	RAPID APPLICATION DEVELOPMENT (RAD)	40
3.6	RATIONAL UNIFIED PROCESSING (RUP)	41
3.7	JUSTIFICATION FOR SYSTEM METHODOLOGY	42
3.8	DESIGN	42
	CHAPTER 4: IMPLEMENTATION	43
4.1	INTRODUCTION	43
4.2	REQUIREMENTS	43
4.3	FUNCTIONAL REQUIREMENTS.....	43
4.4	NON-FUNCTIONAL REQUIREMENTS	45
4.5	FEASIBILITY STUDY	48
4.6	PLATFORM SPECIFICATION	48
4.7	TOOLS USED	48
4.8	LANGUAGES USED	49
	PROJECT REQUIREMENTS.....	51
4.9	SECURITY ISSUE	51
4.10	DATA INTEGRITY & VALIDATION CHECKS.....	51
4.11	VALUE CONSTRAINTS AND RANGES.....	51
4.12	VALIDATION CHECKS.....	52
	CHAPTER 5: SYSTEM DESIGN	53
4.13	SYSTEM ANALYSIS AND DESIGN	53
4.14	SYSTEM DESIGN	54
4.15	DATA FLOW DIAGRAMS.....	54
4.16	USE CASE DIAGRAM	56
4.17	CLASS DIAGRAM	57
4.18	IMPLEMENTATION.....	58
4.19	ADMIN ACCOUNT.....	58
4.20	ADMIN LOGIN	59
4.21	ADMIN MENU.....	59
4.23	HOSPITAL SETUP	60

4.24	USER MANAGEMENT	60
4.25	USER PERMISSION	61
4.26	DOCTOR REGISTRATION	62
4.27	PATIENT REGISTRATION	62
4.28	ADD NEW PATIENT	63
4.29	DOCTOR PRESCRIPTION	64
4.30	ADD PATIENT COMPLAIN	65
4.31	ADD PATIENT DIAGNOSIS	65
4.32	ADD PATIENT DRUGS	66
4.33	ADD PATIENT INV	66
4.34	DISEASES REPORT	67
	CHAPTER 6: TESTING.....	68
4.35	TESTING	68
4.36	LEGEND	68
4.37	TESTING TECHNIQUE	68
	UNITE TESTING	68
	Login Admin	69
	Login Manager	69
	User Management.....	69
	MODULE NAME: ADMIN LOGIN	70
	MODULE NAME: DOCTOR REGISTRATION	71
	MODULE NAME: PATIENT REGISTRATION	72
	MODULE NAME: ADD NEW PATIENT	73
4.38	BLACK BOX TESTING	73
4.39	USER ACCEPTANCE TESTING	74
4.40	JUSTIFICATION AND TEST PLAN	75
4.41	STANDARDS CODING	76
	CHAPTER 7: ANALYSIS	79
5.1	INTRODUCTION	79
5.2	QUESTIONNAIRE	79
5.3	ANALYSIS	83
5.4	INTERVIEW	92
	CHAPTER 8	101
	CONCLUSION	101

FUTURE ENHANCEMENTS.....	101
REFERENCES	102

LIST OF FIGURES

Figure 1: Big data analytics and architecture.....	25
Figure 2: Map and <i>Reduce</i>	26
Figure 3: Map Reduce Diagram	27
Figure 4: Map Reduce Block Diagram.....	27
Figure 5: Agile SDLC.....	31
Figure 6: DSDM Methodology.....	35
Figure 7: FDD Methodology.....	37
Figure 8: JAD Methodology.....	38
Figure 9: RAD Methodology.....	40
Figure 10: RUP Methodology.....	41
Figure 11: System Design.....	54
Figure 12: Login Process.....	55
Figure 13: Logout Process.....	55
Figure 14: Class Diagram.....	57
Figure 15: Admin Login.....	59
Figure 16: Admin menu.....	59
Figure 17: Hospital Setup.....	60
Figure 18: User Management.....	61
Figure 19: User Permission.....	61
Figure 20: Doctor Registration.....	62
Figure 21: Patient Registration.....	63

Figure 22: Add New Patient.....	64
Figure 23: Doctor Prescription.....	64
Figure 24: Add Patient Complain.....	65
Figure 25: Add Patient Diagnosis.....	65
Figure 26: Add Patient Drugs.....	66
Figure 27: Add Patient INV.....	66
Figure 28: Diseases Report.....	67
Figure 29: Admin Login Testing.....	70
Figure 30: Manager Login Testing.....	70
Figure 31: Doctor Registration Testing.....	71
Figure 32: Patient Registration Testing.....	72
Figure 33: Add New Patient Registration Testing.....	73
Figure 34: Black Box Testing.....	74
Figure 35: User Acceptance Testing.....	75
Figure 36: Databases Connection.....	76
Figure 37: MySQL Quire.....	76
Figure 38: Java Code.....	77
Figure 39: Java XML File.....	77
Figure 40: Data Set.....	78
Figure 41: Java HTML.....	78
Figure 42: Map Reduce Coding.....	78

LIST OF ABBREVIATIONS

AHCS	Advanced Health Care System
DMCH	Dhaka Medical College Hospital
EHR	Electronic Health Report

CHAPTER 1

1.0 INTRODUCTION

The healthcare system provides huge number of information which is run by document storing, acceptance and regulatory demand and patient supervision (Raghupathi, 2010). In the age of digitalization new trend is going on where the data is recorded in a form soft copy instead of hard copy. Run by compulsory needs and promise to upgrade standard healthcare system concurrently decreases the expense these enormous number of record maintain the capacity of carrying a vast area of medical and health care system role which contain different clinical determination reinforce, observation of disease, public fitness administration (Burghard, 2012 & Dembosky, 2012).

In health care system, big data assign as computerized system where we recoded huge number of information which is very critical that they are very tough (inconceivable) to run by regular established system or neither they can run smoothly by ordinary or normal device or technique. Big data have the capacity for huge magnitude, variety and quickie to run a system because of this features our healthcare system submerge into big data. In health care system big data develop by store the total patient healthcare and their welfare. It comprise clinical record for COPE, clinical determination reinforce (direction of consultant, medical reports, images, workshop, pharmacy records, insurance and regulatory records); patient document stored in electronic patient record, sensuous record for example tacking from essential indication; social media post like Facebook(Facebook status) or integral and upgrade post in twitter by twitting (Bian, Topaloglu, Yu, 2012), blogs (Raghupathi, 2013), or other medias, clause in medical bulletin.

Scientist enable to access large number and collection of data by the help of big data. By inventing relation, recognizing structure and tendency inside the record big data analytics the capacity to updated responsibility in healthcare system, decreasing the spending range, conserve life. Consequently, big data analytics functions healthcare hold benefits of the multiplication in record to takeout to gain intuitive understanding to develop a preferable sophisticated resolution and experiment also become easy due to big data. The time in which big data is created and analyzed and anterior relation, tendency and

structure are identified the healthcare contributor and other coworkers who associated with healthcare system enable to provide rigorous and understanding help to identifying disease, cure by charging decreasing amount by providing superior care(Knowledgent, 2013). In the field healthcare, the consequences of big data prevails many frameworks. Namely, by evaluating a person nature and expenditure and consequences of supervision to recognize the most clinically and profitable medication and recommend experimental devices through effecting contributor characteristic using sophisticated analytics to person outline to boldly recognize person who could take advantage from prophylactic protection or exchange behavior; suspicious disease outline to recognize precautionary occurrence and reinforce precautionary measures; assembling and printing clinical method, thereby serve persons to identify the supervision protocol and prescribe courses of medication that provide foremost profit. Recognizing, anticipating and decreasing fake by executing sophisticated analytics technique for racket identification and inspecting the authenticity and stability to declare; and performing is near to actual time, declare authority establish creative earning flow by agglomerating and producing electrically patient clinical document and declare document sets to produce record and serve to moderator. Such as authorizing document to promote pharmaceutical industries in recognizing patients for establishing a clinical test. To help patient to manage their safekeeping, to detect their producer, boost up their fitness different type of apps are build. Through analysis, remunerator capable to detect allegiance to medication and therapy regimen and recognize vogue that drive person and people to welfare (Knowledgent, 2013). This paper produces the consequences of big data analysis in medical industry as this is given as a control manner. At the beginning we determine and consider the big data in the healthcare system. Secondly, we explain formational outline of large data in health care system. Thirdly explain big data investigation function in case of building methodology. Then give an example of large amount of data analytics and recognize the provocation. Last of all, we discuss the upcoming situation. Currently management of healthcare system totally operated by big data analytics it help to manage a huge number of patient record for long time period. Though it is a very complex system but is makes human life faster and easy. Big data could transform the healthcare industry.

1.1 AIMS

This project aims to develop a means of electronic patient record management while optimizing the overall performance of the facility and the quality of service while reducing the expenditure of maintaining the standards for individual patients.

1.2 OBJECTIVES

- ❖ To develop an automation system for Bangladeshi hospitals which will also allow them to maintain large amounts of patient records.
- ❖ To design and develop a Big Data storage framework which will allow for future analysis of the stored data.
- ❖ This Big Data framework will also enable hospitals to link information to medical records of different patients along with electronic monitoring devices and also the outcomes of the treatment administered on the patient.

1.3 PROBLEM DEFINITION

- ❖ The existing system is slow due to a hybrid approach to documenting patients, delivering their clinical reports, prescribing and supplying drugs to the said patients and providing them with invoices once they are ready to go home.
- ❖ This also is a resultant of the asynchronous nature of organization and management in the hospitals which results in misplacement of important documents resulting in a slower response.
- ❖ The overall mismanagement results in a gross waste of resources and inefficiency in the hospitals, making their work of delivering care a lot harder than it should be.
- ❖ Consequentially this hybrid approach of using manual means along with automation results in an underemployment of resources in both the manual and automated systems.
- ❖ Most of the personnel and management is not used to the present automation due to its complicated nature and lack of training.

1.4 JUSTIFICATION

Through the problems defined in the Problem Definition section it can be easily asserted and assumed that the management of Dhaka Medical College Hospital (henceforth to be addressed as DMCH) is unaware of properly implementing the automation processes or develop a framework or infrastructure for it to synchronize with the existing manual one. This research will provide a gateway to allow a top-down overview of the entire workflow allowing the management to improve and optimize the performance of the organization and the healthcare services that it provides by implementing AHCS in the said scenario, i.e. DMCH. So following are the principle issues of this research:

- ❖ To give improved medical care to the patients at a lesser cost while also reducing the hospital's expenditure and improving the organizational coherence to improve and optimize the overall performance.
- ❖ To enhance the knowledgebase of AHCS to provide better care in other instances of implementation of the software in different scenarios and situations.

1.5 PROJECT LIMITATIONS

This research assumes and accepts the following limitations which might bar it from achieving a total dominion over the above stated problems:

- ❖ Time

This is a major concern as new unanticipated issues might arise and are required to be dealt with in the development process which might take unaccounted time.

- ❖ Technical skills

The researcher even though holds a degree in Computer Science lacks industry level skills to develop and deliver the system swiftly with industry level professional efficiency as he might stumble across unpredictable situations in the development process.

- ❖ Relevant materials

Even though the researcher's research skill is sound, it can't be expected that he will be able to access or find relevant materials at all times when and if new problems are to be addressed.

❖ Development approach

The programming language and platform along with the design methods will try and reduce the risk involved with this.

1.6 RESEARCH QUESTIONS

Following the issues discussed in the Problem Definition phase, through this project we intend to study and provide insightful solutions by developing AHCS for DMCH in a manner which will comply with the organizational structure, the people involved, their technological aptitude and also the technological assistance that DMCH can provide us with, thus encompassing the perspectives of these many socio-technical models involved in the process. Information systems are usually based on the interaction of individuals with different parts of the system thus it is imperative that we understand and take account of the social environment before jumping into the abyss of development. A well thought system thus will become part of common social and organizational practice whereas a hastily developed solution will only increase the waste of resources rather than employing them in a useful manner thus we are compelled to ask the following research questions:

1. How does big data help to reduce the expenditure in healthcare system?
2. What shorts of necessity big data provide us?
3. What are the cons of large amount of data in healthcare system?

The socio-technical perspectives of the involved personnel along with the organizational structure and the currently deployed solutions, manual and automatic, along with the technology that is currently at use in the organization will help us determine the need of new technology and how to improve the performance of the work process of various tasks that take place inside the organization. Without a full knowledge of these a proper and effective implementation cannot be expected (Watson, 2007).

1.7 RATIONALES

- ❖ The technological infrastructure will not rot away being unused, rather will be utilized properly with the help of the AHCS which would allow proper employment of such resources in an orderly manner.
- ❖ Big Data system will help in making the diagnosis and prognosis of diseases for both individual and collective of patients and will optimize the time spent by the hospital personnel to decide and respond faster to medical emergencies.
- ❖ The digitization and storage of data by employing Big Data framework will provide a basis for future researches by being a well of research data which can be easily dissected and analyzed.
- ❖ This system will also help reach the remote healthcare infrastructure both in the country and outside and provide patients with proper care
- ❖ Through this framework data can be shared with other researchers or similar systems worldwide.
- ❖ By focusing efforts in the appropriate area by using the Big Data system the human resources of the organization will achieve efficiency through less efforts.
- ❖ Big Data will also allow for reducing unnecessary expenditures and reduce the cost of treatment for the patient.
- ❖ It will also greatly improve the level of care provided by the facility and reduce the mortality rates in patients by doing

CHAPTER 2: LITERATURE REVIEW

2.0 BACKGROUND OF STUDY

Big Data helps reduce costs, while improving the quality resulting in an increased value for the organization. It simultaneously has enabled Accountability in the sector and allows accountable care to be delivered to the patients. Rising healthcare costs have forced the hospital revenues to a heightened yet steady state. The service delivery model in hospitals have evolved, thus the hospitals should adopt and adapt to new technologies which allow for them to reduce healthcare costs while maximizing revenue a result of which had been the introduction of bundled payment methods and home-centered medical care while maintain a standard of accountable care in both the cases (Carol McDonald, 2016).

Tom Hardy, (2016) notes that data analytics has helped raise the standards in the healthcare sector mostly in the fields stated below:

- ❖ **For maintaining public health** disease patterns provide a rare insight into the method or manner of contamination and how it is being transmitted. It also helps to predict disease outbreaks and other issues involving public health, mostly it helps us determine the need in specific areas/populations and offer required solutions/services while helping us prevent future catastrophes by predicting them beforehand.
- ❖ **Electronic Medical Record (EMR)** provides the system with the raw structured and unstructured data to crunch on to produce the data analysis which enables us to predict risks in patient to provide them with effective care.
- ❖ **Patient Profile Analytics improves and depends on EMR** and also provides us with another interesting prospect in order to expand the services by identifying patients with a preemptive approach towards their afflictions, thanks to the patient profile analytics that will help achieve that.
- ❖ **Genetic diseases are better targeted and resolved through Genomic Analytics** plowing through the patient records and their respective profiles,

the data can enlighten us with new interpretation of the genetic predicaments, old and new.

- ❖ **Fraud Analysis** provides the hospital a means to challenge and stop the fraudulent dealings which make them lose revenues, data analytics provides them to minimize such fake claims and helps them maintain a revenue surplus.
- ❖ **Safety Monitoring for individual and patients in a collective** manner can be deployed to help analyze real time bulk data from different sensors and other input mechanisms in the hospital. This enhances safety in terms of individual and also in groups and allows a means for negative event prediction.

It is also stated in Hardy, (2016) that this technique is similarly deployable for diverse healthcare organizations, ranging from individual physicians to healthcare organizations. This technique can also be deployed to cope up with individual and population health issues along with fraud management in an effective way. It further promotes clinical innovations to achieve affordable ways to diagnose and treat patients while allowing pragmatic R&D methods for the different drugs and devices which require to be tested in the field to explore and develop new methods of treatments that are introduced into the market while helping analyze clinical trials prior to a product (drug or device) before reaching the market.

2.1 BIG DATA TECHNOLOGIES

Scientist from medical is facing difficulties during managing, studying and storing a large quantity of dataset (Margolis, Derr, Dunn, 2014). The features vast aspects expect novel and potent system to reproduce valuable aspects and enable to provide better solution for healthcare. From various illustration, we able to recognized some system that were pre-loved collectively, which comprise Artificial Intelligence (AI), along with HADOOP and records mining equipment (White, 2012). For managing enormous information parallel computing plays a vital role and act as a fundamental infrastructure. It is able to accomplish a set of rules and responsibilities at the same time on a knot of machines and

supercomputer. Previous year novel parallel computing models which may include to decrease map by the help of Google supply of open map reduce is known as HADOOP changed into released by means of apache for distributed facts control (Dean, Ghemawat, 2008 & White, 2012). To penetrate into the bundle of machine HADOOP distributed document device (HDFS) work concurrently in statistics. Cloud-computing structures are consider as HADOOP based system which allow them to store data centrally as well as increase the accessibility of data through internet.

2.2 BACKGROUND STUDY OF DHAKA MEDICAL COLLEGE

The present control management system at Dhaka Medical college hospital, Dhaka, Bangladesh.

The statistics float used is a one directional machine where the receptionist refers patient to medical doctors, doctors referring patients to the pharmacist both in and out patients and the same manner out. The system this is currently getting used in the medical institution is entirely manual. When a patient requests drugs from the personnel, all of the records is recorded manually from the drug dispenser (pharmacist). In addition whilst the dealer provides capsules all the statistics from the dispenser to the account on capsules is recorded manually (Ravindra Ch, G Rajesh, Annapurna G, Ch Swetha, M.Ashish Reddy, G.Goutham Krishna, 2016). The subsequent are the weaknesses of the present day system at the hospital:

1. The health center personnel reveals it tiresome and time ingesting while computing affected person information, drug provider and team of workers price receipts and voucher cards this ends in delay in scientific reports.
2. The medical institution management presently makes use of health record files for storing sufferers and drug dealer's facts. This system of statistics garage is susceptible to protection issues inclusive of illegal change and replace of records.
3. The personnel normally waste a number of time in retrieving statistics.
4. The paper work reduces the efficiency of the machine.

2.3 DESCRIPTION OF HOSPITAL

Hospitals are an organization that severs medical treatment and take care of their patient for improve their health condition. Mainly they work for medical institution and corporation. In hospital it is needed to collect patient information. And sophisticated technological system must be used for proper diagnosis of patient. Our hospital system extensively depends upon the information and technologies in various important processes. Approximately 2752 European center manager inform us that our hospital system totally depend upon technologies. To produce remedy to its patient government help us by providing all kind of developmental skills and funds. There is no uncertainty that health care management is a developing trade and enhancing scopes in both direct and non-direct way. In recent era our healthcare system are supervise by large organizations that would only contribute those people who are able to yield them. Its service receivers are patient's residents or clients. Now a days the administration of quick healing center focusing on EMR (electronic medical records) system. The infrastructure and implementation of these data support crucial component for fulfill patient need, elevate the effectiveness of clinical and social insurance quality, improving the medicinal service, and alleviate the patient health expenditure (Ravindra Ch, G Rajesh, Annapurna G, Ch Swetha, M.Ashish Reddy, G.Goutham Krishna, 2016).

2.4 BIG DATA ANALYSIS IN HEALTHCARE

Information extent is depending upon to develop significantly in the years ahead. Furthermore, repayment model are changing in social assurance. In the recent medical services condition importance of use and pay for execution are elevating. Even if the outcome is probable it is essential to spark. It is the basic need for social assurance organization to assure the penetrability to the device, foundation and procedure to utilize vast information viably or else hazard losing conceivably a large number of dollars in income and benefits (LaValle, Lesser, Shockley, Hopkins, Kruschwitz, 2011).

What precisely is huge information? A file conveyed to the U.S.A congress in august 2012 characterizes huge facts as "massive volumes of high pace, complex, and variable information that require propelled techniques and advancements to empower the catch,

stockpiling, dispersion, management and research of the data. Huge information includes such qualities as assortment, speed and, with deference particularly to human services, veracity (Connolly, Woledge, 2013 & Courtney, 2013). Existing scientific procedures can be connected to the huge measure of existing (however right now unanalyzed) tolerant related well-being and therapeutic information to achieve a more profound comprehension of results, which at that point can be connected at the purpose of care.

2.5 BENEFITS TO HEALTHCARE

Healthcare corporations starting from single-doctor offices and multi-issuer corporations to massive health center networks and accountable care agencies stand to understand notable advantages by using digitizing, combining and efficaciously the use of huge data (Burghard, 2012). Sizeable advantages contain perceive illnesses at very starting when they can be cured extra without difficulty and efficiently; point out particular character and population fitness and figuring out health care fraud extra speedy and effectively. By means of the help of massive facts analytics huge question can be replied. based on huge quantity of ancient statistics they are able to anticipated the outcome and certain improvement like duration of live (LOS); patients who will pick non-obligatory surgical treatment sufferers who possibly will not advantage from surgical procedure, complications, sufferers at threat for clinical complications; patients at risk for sepsis, MRSA, C difficult, or different health center-received infection; contamination/sickness development; patients at threat for advancement in sickness states; causal factors of infection/disease development; and viable comorbid situations (EMC consulting). Big facts analytics can permit extra than \$three hundred billion in savings in keeping with year in United States healthcare, thirds of that through discounts of about eight% in countrywide healthcare expenses it is estimated by means of mckinsey. Of the biggest areas for ability monetary financial savings are the clinical operation and R & D with \$a hundred sixty five billion and \$108 billion in waste respectively (manyika, chui, brown and byers, 2011). In keeping with mckinsey waste inefficiency may be lessen inside the following 3 regions:

Clinical operations: comparative research have to be done to understand more clinically applicable and price-effective tactics to diagnose and address patients.

Research & Development: 1) anticipate modeling to reduce attrition and provide a leaner, faster, more targeted r & d pipeline in drugs and devices 2) statistical gear and algorithms to beautify medical trial format and affected character recruitment to higher wholesome treatments to person sufferers, therefore reducing trial disasters and rushing new remedies to market and 3) reading medical trials and affected character facts to hit upon follow-on indications and find out unfavorable consequences earlier than products attain the market.

Public health:

1) Recognized the pattern of disease and outbreaks and transmission of disease can be traced by observing improve public health and accelerate the response of public; 2) Develop vaccine more accurately at a faster rate. For example annual influenza strains should be chosen; 3) huge amount of data should be turn into applicable that can be able to recognized want, produce facilities, anticipated and prohibited difficulties to help public (Manyika, Chui, Brown and Byers, 2011).

In addition, shows large information analytics in healthcare can make a contribution to

Evidence-based medicine: To in shape treatments with consequences, predicted sufferers at hazard for disease or readmission and bring extra green care integrate and have a look at one of a kind form of structured and unstructured information-EMRs, monetary and operational information, scientific data, and genomic information.

Genomic analytics: Greater correctly and cost efficiently sequencing of gene must be executed to accomplish genomic statistics. Broaden genomic analysis as a part of normal medical decision technique and growing patient medical manner.

Pre-adjudication fraud analysis: to reduce fraud, waste and abuse rapidly examine huge numbers of claim requests.

Device/remote monitoring: for protection monitoring and detrimental occasion prediction accumulate and examine actual time huge extent of rapid, moving statistics from in-medical institution and in-tool.

Patient profile analytics: To become aware of individuals who could gain from proactive care or life-style adjustments develop analytics must be apply to patient profile. As an example, those patients vulnerable to developing a particular sickness (e.g., diabetes) who could gain from preventive care via increasing data and analytics permit the greatest

consequences contain: detecting sufferers who are the full-size consumer of fitness staffs or at the tremendous uncertainty for unfavorable consequences; producing individuals with the records they need to develop knowledgeable end and extra correctly manipulate their very own health as well as extra easily habitual and identified healthier behaviors; discover treatments, programs and techniques that do not provide confirmed benefits or expenditure too much; alleviating attractiveness with the aid of detecting environmental or lifestyle aspect that raise uncertainty or elicit disadvantageous incidents and balancing treatment plans as a consequence; upgrade results by means of analyzing essential from at-home fitness monitors; supervise public fitness by using recognized responsibility inside patient populations all through disease outbreaks or failures. To analyze aid usage productively in actual time via bringing clinical, financial and operational records collectively

2.6 ARCHITECTURAL DESIGN

The conceptual form for a big facts analytics scheme in healthcare is just like that of a traditional fitness informatics or analytics challenge. Major difference found in how processing steps are completed. The mission of ordinary fitness analytics is to perform the analysis by the help of commercial enterprise intelligence device only which may comprise desktop or computer. Because massive facts are via definition big, only one node is use throughout the process to perform. The notion of dispensed processing has present for a long time.

Enormous aspects of analytical device, on the other hand, are remarkable difficulties, large -scale programming, and entail the entreaty of a disperse capability. They've seem in an observe hoc pattern commonly as open-supply improvement tool and infrastructures, and consequently they deprive of the steering and user-friendliness that dealer-driven proprietary tools own. Inner and external sources such as digital health statistics, scientific choice assist systems, cope, government sources, laboratories, pharmacies, insurance groups & HMOs, etc. are provide huge information about healthcare. Data information also frequently collected from a couple of codecs and residing at more than one locations (geographic in addition to in distinctive healthcare companies 'sites) in several legacy and different packages. Sources and data type comprise:

1. Internet and social media information: Facebook, twitter, LinkedIn, blogs, etc provide information about clickstream and interaction. Sites, smartphone apps, etc also encompass health plan web
2. Device to Device facts: readings from a long way off sensors, meters, and different essential signal gadgets.
3. Conduct with enormous statistics: health care assert and other billing data an elevate number of available in semi-structured and unstructured codec's
4. Biometric information: finger prints, genetics, hand writing, retinal scans, x-ray and distinctive clinical pix, blood pressure, pulse and pulse-oximetry readings, and awesome comparable kinds of facts.
5. Information generated by human: unstructured and semi-structured data comprehensive of EMRs, physician's notes, electronic mail, and paper documents.

To obtaining enormous analytical records, this aspect has to be integrating. Inside the second point the aspects is in rare world and desire to be prepare or modify, at which aspects various substitute are to be had (Wullianallur Raghupathi and Viju Raghupathi, 2014). A service granted architectural approval mixed with web services (middleware) is one opportunity.

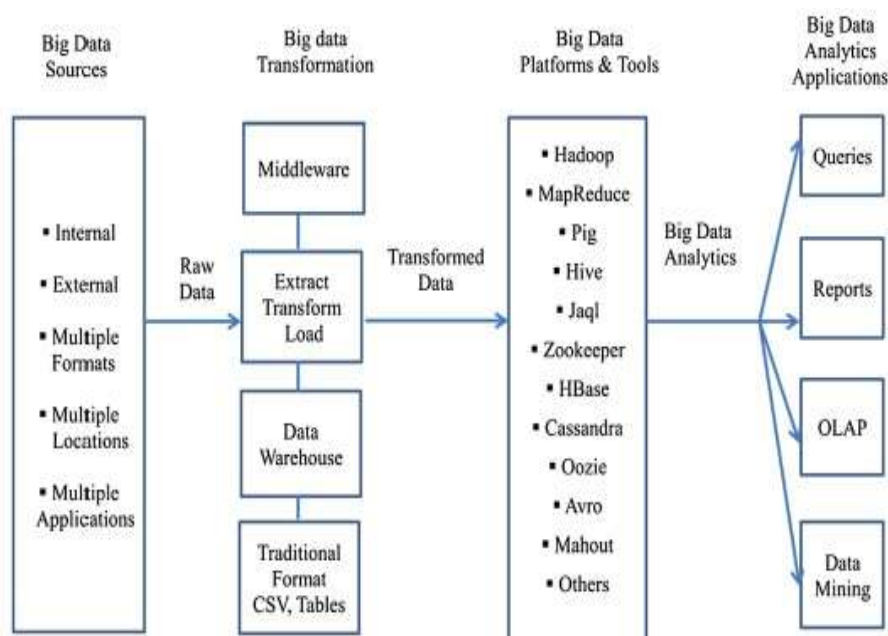


Figure 1: Big data analytics and architecture (Wullianallur Raghupathi and Viju Raghupathi, 2014).

2.7 USE OF MAPREDUCE ALGORITHM

There are the two processing phases map reduce works by breaking things down: Map phases and Reduce phases. For each stage the key-value pairs act as their input and output, where the types of which were easily customizable. The customization stage also states the two functions: the mapping function and the reduction function (Ravindra Ch, G Rajesh, Annapurna G, Ch Swetha, M.Ashish Reddy, G.Goutham Krishna, 2016).

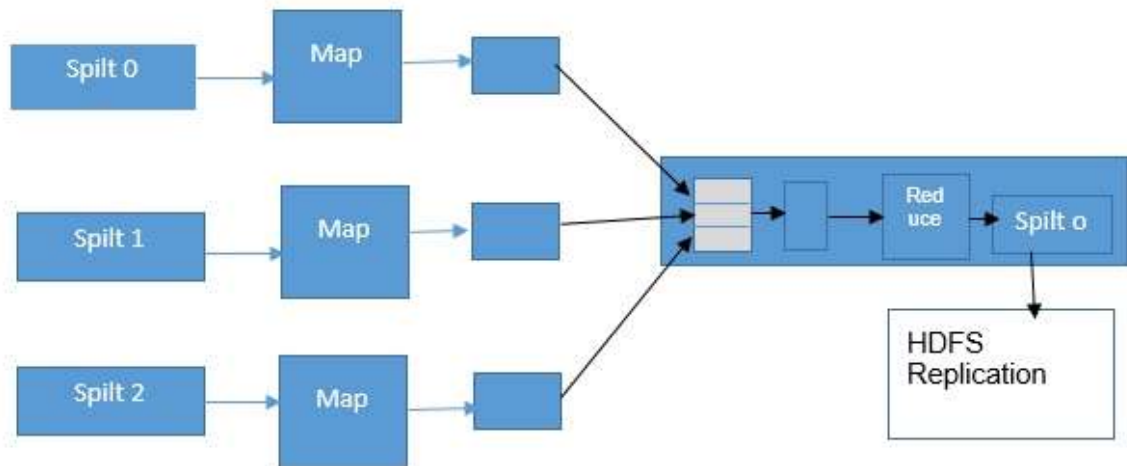


Fig 2. Map and Reduce (Ravindra Ch, G Rajesh, 2016)

Map Reduce algorithm contains two tasks, namely Map and Reduce. The task of mapping is carried out by the Mapper Class whereas the task of reduction is assigned to the Reducer Class. Mapper class tokenizes, maps and sorts the provided input. The output of Mapper class is fed into the Reducer class as input, which then searches for matching pairs to reduce them into the output.

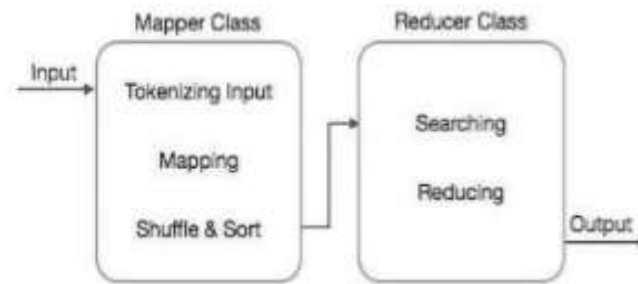


Fig 3: Map Reduce Diagram (Ravindra Ch, G Rajesh, 2016)

The Map Reduce algorithm gears various algorithms to divide the tasks into smaller parts to allocate them to multiple systems. In simpler terms, Map Reduce algorithm sends the Map & Reduce tasks to designated servers in a cluster. These smaller algorithms include Sorting, Searching, Indexing and TF-IDF to say the least.

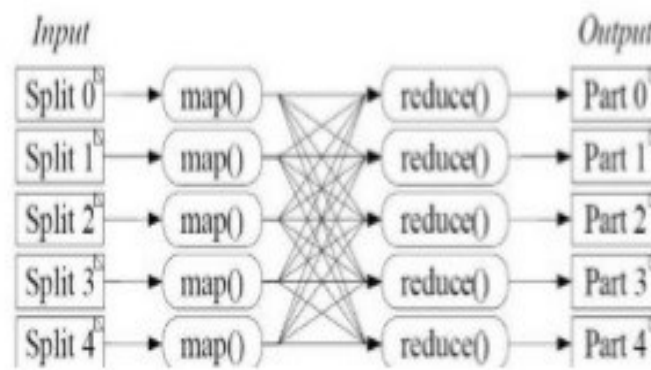


Fig 4: Map Reduce Block Diagram (Ravindra And Krishna, 2016)

2.8 COMPARISON BETWEEN EXISTING SYSTEM AND NEW SYSTEM

In present device challenges at big scale acting big scale computation is hard. To work with this volume of records requires dispensing components of the trouble to more than one machines to deal with in parallel. each time multiple machines are utilized in cooperation with one another, the opportunity of disasters rises. In single-system surroundings, failure is not something that software designers explicitly worry approximately very regularly if the machine has crashed, then there's no manner for the program to get better anyway (Ravindra Ch, G Rajesh, Annapurna G, Ch Swetha,

M.Ashish Reddy, G.Goutham Krishna, 2016). For instances Dhaka, Medical college use this system.

New system

This system can do large scale computation easily. One system is strong enough to handle large volume of data. There are no probability failures if this system use. There is cloud storage integrated with this system such that if the machine crashes the data can be recover any time.

2.9 SOFTWARE SPECIFICATION

Thinking about this enterprise level software we have to decide a complete development language and framework which gives modularity, expandability and integration with current technologies. The open supply java enterprise edition (JEE) with spring framework is the proper candidate for this venture scope. java spring framework provides top notch support for aligning the enterprise necessities with the web software communication layer. Spring additionally offers the maximum popular and sturdy MVC pattern structure which helps developer to prepare a corporation application in 3 layers: M - Model, V- view, C - controller. Model (M) integrates the utility commination layer / controller (c) with the statistics get right of entry to layer and the communication layer integrates the presentation layer / view (V) with the Model (M) layer. This most practiced architecture advantages one-of-a-kind varieties of developer (e.g.: the front-quit, again- cease) concurrently on a complicated and big scale utility.

A number of the advantages and key components of spring MVC framework:

- ❖ spring gives well-designed, modular and complete net software framework which is a high-quality exchange to the traditional net framework.
- ❖ spring consists of the help for mapping enterprise facts into java statistics objects which is known as pojo (simple vintage java object). so, consumer facts taken from the presentation layer can without problems mapped into statistics gadgets. in quick spring framework affords a nicely-described interface to business necessities layer.

- ❖ spring is taken into consideration as encyclopedic framework which addresses the maximum infrastructure related concerns of typical web-software which is also sponsored by means of an in-depth community of builders.
- ❖ spring provides effortlessly accessible singleton service manufacturing unit bean training which incorporates the business regulations, constraints and float which increase the possibility to re-usability.

CHAPTER 3. METHODOLOGY CONSIDERATION

3.0 INTRODUCTION

An outline of the proposed gadget has been given. For the proposed system to be fully developed to meet its favored necessities, there needs to be records collecting exercise aimed at getting applicable facts towards developing the system. On the equal time, a scientific step by step approach has to be used within the layout and development of the proposed system. At this critical point of the research comes to handy Research methodology and system methodology.

3.1 RESEARCH METHODOLOGY

The research will be designed and conducted through the post positivism framework, the purpose of which is to explain the relationships among the clinician's characteristics and perception of ease of use and usefulness. To achieve that a mix of quasi-experimental, go-sectional and correlational techniques are employed. Use of the quantitative approach provides a numerical dimension and analysis of the examined variables (Creswell, 2009). The experimental design randomly assigns participants; however, a quasi-experimental layout does not, given the embedded variables the contributors already possess—for example, age, gender, years in practice, and so forth—it's simply not possible to create an experimental design in this case. A correlational technique can offer significant facts and approximately the elasticity of the relationships between the embedded variables and patient satisfaction ratings (Bordens & Abbott, 2011; Creswell, 2009).

Methodology of research is the essential part of a research. To coordinate a research smoothly methodology is essential followed by Creswell (2009). Furthermore he correlates the research with question. Research methodology following some questions area:

- ❖ How to implement big data in healthcare system?
- ❖ Where should we collect data?
- ❖ What are merits and demerits?

3.2 DEVELOPMENT METHODOLOGY

Introducing an international approach in development requiring constantly evolving feedback from the doctor's and specialists, the AGILE development method will bear more fruits (Gunasekaran and Irani, 2014). This method of development also allows to adapt the solution for adjustments when necessary requirements evolve, even at an advanced stage. A quantitative approach in establishing the customer information base, analysis and plans (Hall and Partyka, 2012). In three sessions will take place such gatherings will take place, a session with the officers who are fresh into the organization, another will be with the pros and toward the end, the experts. There can be different meetings with the same of group of people multiple times.

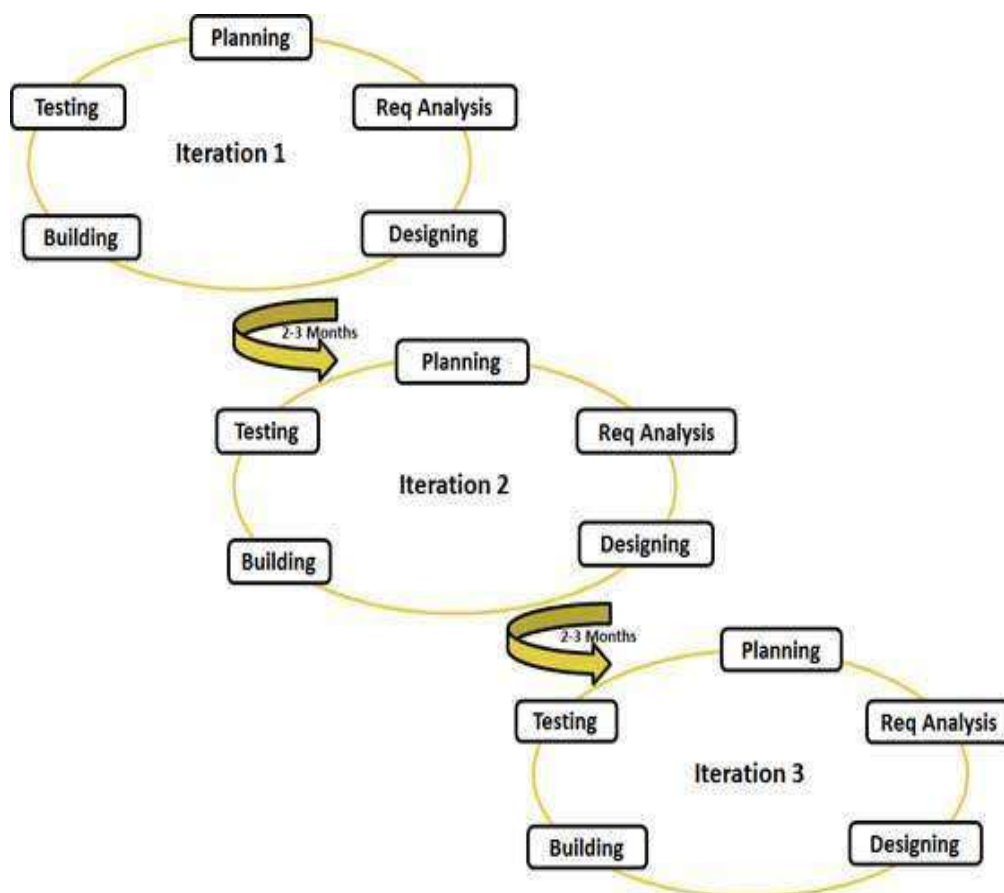


Fig 5: Agile SDLC

3.3 TYPE OF RESEARCH

For conducting a research study three type of research are found followed by Creswell (2009). They include qualitative, quantitative and mixed method research. Before implementing big data in any hospital qualitative analysis should be done to find out the major place to explore and also point out the major problem associated with big data to solve that major problem to providing a good quality service. To providing a quality service at first we should try to understand pattern of work and the cultural value from those areas. Qualitative research is most preferable for this research study because if we want to understand the working pattern we have to communicate with each hospital personnel to find out their working environment, their life style, and their working ideas. According to Myers & Avison (2002), natural, social and cultural phenomena are studied and designed by qualitative research. Main purpose of qualitative research is to understand the social reality and interpret which are studied in qualitative research and try to troubleshoot those problems (Bryman, 1988). According to all researchers before implementing big data system in our hospitals we should evaluate our hospital personnel and their opinion about this advanced system. Additionally we should find out the personnel attachment with their work, their desire to work with new system. People decision, belief, social value around their environment is determine by the qualitative research evaluate by natural observation no artificial this involve I qualitative research (Denzin and Lincoln, 2000).

3.4 INTERVIEW

An interview is usually completed by using deciding on listing of open ended questions and asking an expert in that area centered questions aimed toward getting targeted records that could similarly help inside the design and development of the proposed machine. An interview has been designed with 10 structured questions. This are given underneath:

1. Could you explain Big Data in healthcare system based on characteristics?
2. Could you summarize the best requirement to generate this system?
3. Could you recommend an appropriate methodology for the advance system?

4. Could you recommend an appropriate growing platform for the advance system?
5. Could you recommend an appropriate database for the storage of information for the advance system?
6. Could you recommend an appropriate structure for the advance system?
7. Could you recognize feasible ultimatum that may be confronted in the operation of establishing the proposed system and how to solve them?
8. Could you summarize the appropriate test plans for the proposed system?
9. Could you propose best surveillance evaluate for the proposed system?
10. At the end, what type of outcome from this system?

3.5 ANALYTICS AND DATA MINING

Data mining is the process of mowing through large data sets to identify patterns and establish relationships to get more information about a certain matter through data analysis. This term additionally consists of the means by which these statistics are accrued, filtering and guidance of the facts for use and in the end the processing of records to guide data analytics and predictive modelling (Russom, 2011).

3.6 DATA COLLECTION

The first stage of information mining is the method of accumulating and amassing data. However, even before amassing the facts, thoughts and plans need to be assumed to determine which information ought to be collected which will accumulate specific statistics as favored and use it efficiently (Iamont, 2010). Furthermore, Chordas (2001) stated that a lot of tasks fail and exceed expected concerns because of terrible exceptions of accumulated records which could result from poor information cleansing.

3.7 SYSTEM AND TECHNOLOGY

According to Hersh (2002) who state that healthcare sector should have convenient technology and framework to begin the AHCS applicable method as the era allow a prosperity AHCS implementation. According to Baus (2004) the deficiency of hardware

and software in appliance is most essential plight. So it's far clear that for beginning the AHCS implementation there have to be sufficient it framework. Currently, in aerobic logical area, it framework is not enough there are a few computer systems and net useful resource to be had in cardio logical area however it isn't always enough to begin the implementation machine. There may be a preference of enough it framework which can assist the implementation of AHCS. It framework approach servers, workstations, net, community gadgets, and packages and databases. It section is selected to construct this framework and ensure its security. All hardware and software application corresponding duties for computing and network systems within craniological section can be registered and enjoy uniform with the divisional regulation after improvement of it branch in DMCH. All of the funding interconnected to hardware, software application and the implementation of his can be completed thru it department. It sectors is the backbone for beginning the implementation in any infirmary.

3.8 SYSTEM METHODOLOGY

3.1 INTRODUCTION

System underneath necessities specification as well as logical designs earlier than the physical development is performed. Within the logical design, it is important a gadget method is great defined in terms of improvement and framework in addition to shape and manage plan. AMTF (2014) defined it pronouncing “*software application development technique or machine improvement approach in software program application engineering is a framework this is used to shape, plan, and control the machine of developing a facts device*”.

Similarly clarification also revealed that there are multiple gadget methodologies that may be used and the developer needs to observe each one to peer which nice fits the proposed device to be developed. A few of the system methodologies could be tested to peer which one would best healthy the proposed gadget which is the advanced health care system.

3.2 DAYNAMIC SYSTEM DEVELOPMENT SYSTEM (DSDM)

It became advanced inside the United Kingdom as an evolution of rapid application development practice. It's miles known for providing training aid in addition to documentation strategies. It is primarily based on nine ideas which are

1. Lively person involvement.
2. Empowered teams that the authority to could make choices.
3. A focal point on common delivery of products.
4. The usage of health for business cause because the crucial criterion for attractiveness of deliverables.
5. Iterative and incremental development to make certain convergence on an accurate commercial enterprise solution.
6. Reversible adjustments at some stage in improvement.
7. Necessities this is base covered at a high stage.
8. Included checking out throughout the life cycle.
9. Collaboration and cooperation among all stakeholders.

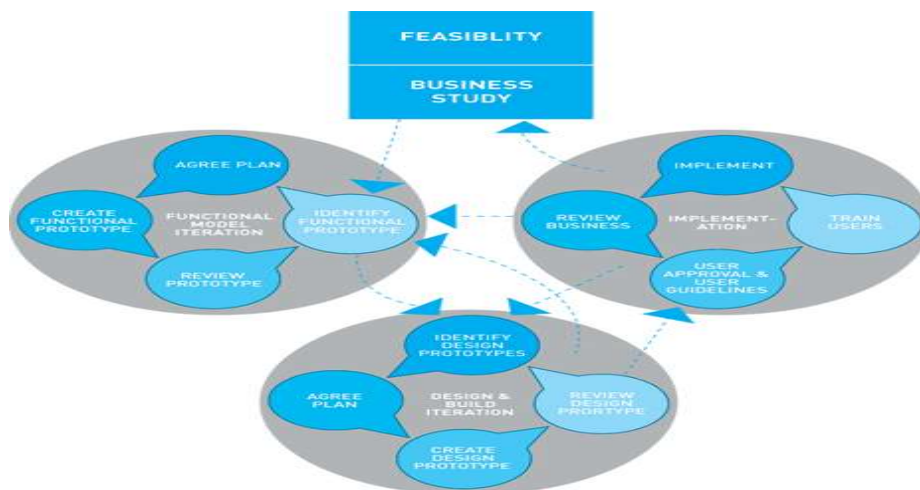


Figure 6: DSDM Methodology

The DSDM is made from five developmental stages as described with the aid of Clifton and Dunlap (2003) which are:

❖ **pre-undertaking**

The assignment conceptualization and selection to begin the task is made as it also is made from

- ❖ Feasibility look at: finding out if the venture is viable or now not
- ❖ Commercial enterprise look at: locating out the possibilities in phrases of business aspect of the project.

❖ **Useful Model**

Functional prototype of a gadget are first made before the modelling takes location, this is where the functional is made as described by means of Clifton and Dunlap (2003) pronouncing “prototype of the functions the machine need to perform and how it ought to perform them.” it stages are:

- ❖ Investigation
- ❖ Refining
- ❖ Consolidation

❖ **Design and construct**

That is the degree wherein the logical layout and the physical development of the device is carried out. The logical design involves system modelling at the same time as the physical improvement includes coding and debugging.

❖ **Implementation, installation and preserve**

Undertaking is finalized, exceeded over, documentation of the product is finished and an overview file is likewise produced that compare the requirements of the gadget with fulfilment in the machine.

❖ **Post-Project-Maintenance**

This comes with other necessities this is performed after assignment need to have been surpassed over to customer.

3.3 FEATURE DRIVEN DEVELOPMENT (FDD)

This system was developed by means of two people: Jeff de Luca and peter Coad. The power is in the fact that tactics to make sure scalability and repeatability. It additionally encourages creativity and innovation at some stage in development. It's far satisfactory describe in phrases of declaration that:

- ❖ A simple, however properly-outline procedure will paintings quality.
- ❖ “Process pleasure” can hold the actual paintings from taking place
- ❖ Appropriate tactics are moved to heritage which permits the crew member to cognizance greater on results
- ❖ Very quick, iterative and characteristic driven life cycle are considered the first-rate
- ❖ A gadget for constructing systems is necessary a good way to scale to larger initiatives

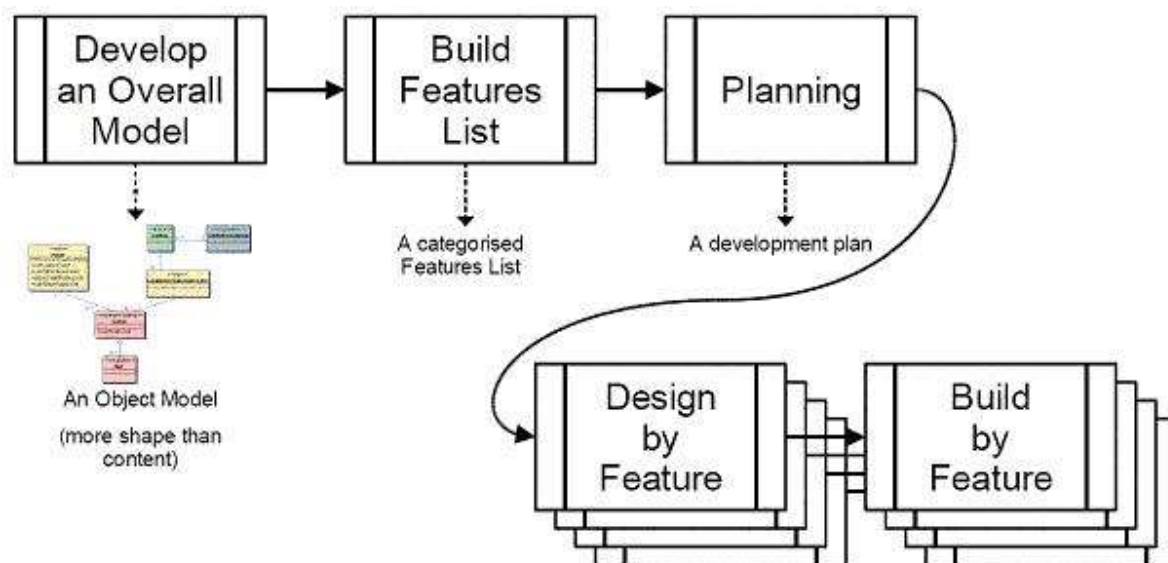


Figure 7: FDD Methodology

Characteristic driven improvement has 5 essential tactics as defined via palmer (2014) which might be:

- ❖ **Develop an Overall Model**

Palmer (2014) defined this procedures saying “it needs that a team invest simply sufficient attempt at the beginning of a challenge in exploring the structure of the trouble by way of

building an object model of the trouble domain". It additionally described it in terms of move-purposeful, collaborative and time boxed hobby.

❖ **Build a feature list**

Palmer (2014) described this section as "the team subsequent constructs the fdd equal of a preliminary, overall product backlog. In preference to user stories or backlog gadgets, FDD talks approximately features.

❖ **Planning**

To devise through characteristic in reality method to collection units of capabilities for a positive type of sports in a way that it suits into a plan and it's in addition assigned to a developer that could develop them right into a software

❖ **Layout via function**

This includes designing the proposed device primarily based on its capabilities and functionalities consistent with the machine requirements

❖ **construct with the aid of feature**

Constructing by function additionally involves bodily improvement of the proposed machine primarily based on its capabilities one after the opposite.

3.4 JOINT APPLICATION DEVELOPMENT (JAD)

The joint software development as described by using Crosby (2013) pronouncing "a necessities-definition and consumer-interface design method in which stop-users, executives, and developers attend excessive off-web page conferences to exercise session a gadget's information". He later went directly to similarly say it "pursuits to involve the consumer within the design and development of an application".



Figure 8: JAD Methodology

The JAD is made from 6 ranges of development that are:

❖ **Requirements**

That is wherein each machine and person requirements are all generated for the proposed gadget

❖ **External Design**

That is wherein all entities that makes up the system are recognized consisting of records float and system verbal exchange

❖ **Internal Design**

The is referred to as the logical layout in which the blue print of the proposed device is truly finished

❖ **Program Development**

This stage is wherein the bodily gadget is completed by way of coding and debugging this system

❖ **System Testing**

The program written desires to be examined a good way to eb certain it meets its certain necessities

❖ Installation and Maintenance

That is where machine is migrated to desired surroundings and further maintained as protection is constantly a continuous manner.

3.5 RAPID APPLICATION DEVELOPMENT (RAD)

The RAD is pleasant defined in an iterative collection. Ramsoft (2012) was able to explain this methodology saying “fast software improvement (RAD) method used minimal planning in favor of fast prototyping, permitting software program to written quicker and makes it easy to trade the requirement”.

It has six principal development levels illustrated within the diagram under



Figure 9: RAD Methodology

It stages are

- ❖ Analysis & Research
- ❖ Information Architecture

- ❖ Interactive Prototype
- ❖ Application Development
- ❖ Test
- ❖ Deploy

3.6 RATIONAL UNIFIED PROCESSING (RUP)

The RUP is defined through Ang (2012) by using first pronouncing “RUP as the acronym states, is a rational unified method that's originally developed through rational developer as a software program improvement method” he later found out that “based totally on UML, RUP organizes the improvement of software into four stages every consisting of 1 or greater executable iterations of the software at that level of improvement”.

This is illustrated underneath

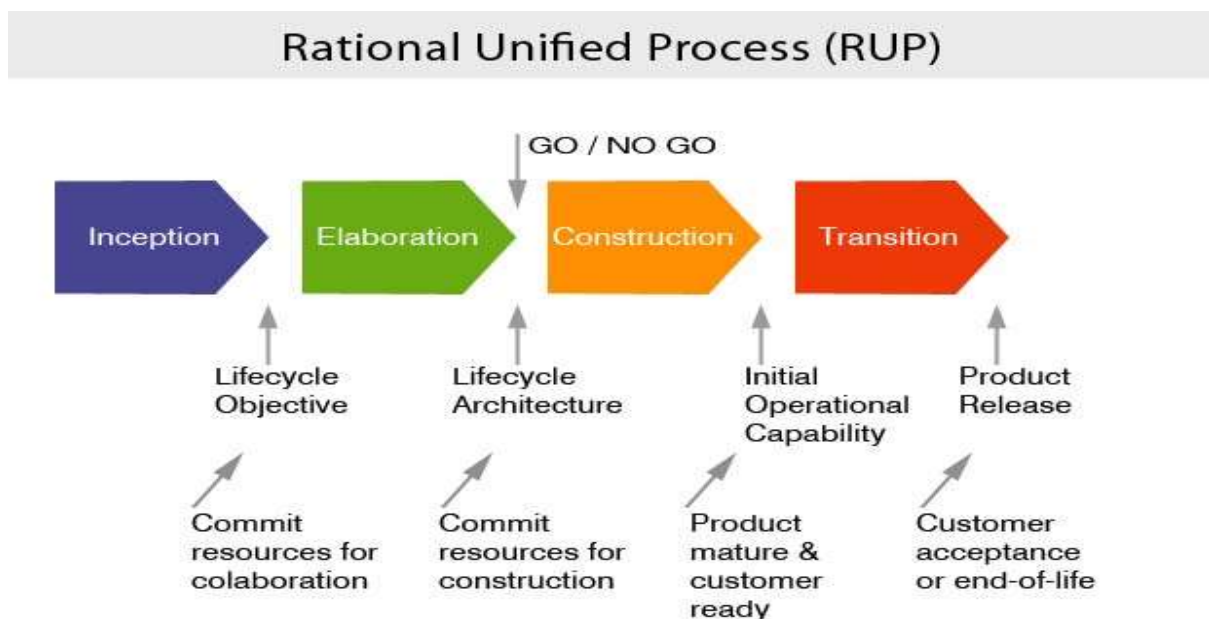


Figure 10: RUP Methodology

The RUP shows there are four levels concerned which might be:

- ❖ **Inception**

This is where the decision is made via the group concerned if the undertaking is possible or no longer. It additionally includes scope and the wanted resources

❖ **Elaboration**

A closer observe the project in phrases of architecture and standards for use to evaluate the architecture are all performed. Dangers analysis is also finished here whilst new technologies are also added

❖ **Construction**

Development is performed and finished right here with coding executed. This stage also includes testing the advanced gadget to see if the necessities have been met

❖ **Transition**

This is in which very last adjustment are finished to the broaden system based totally on person comments as well as usability.

3.7 JUSTIFICATION FOR SYSTEM METHODOLOGY

The distinct system methodologies had been examined. They include DSDM, FDD, JAD, RAD as well as RUP each of the methodologies have their personal respective benefits and nest state of affairs they fit into an attention of all subsequently led to the selection to apply a hybrid methodology. This is because every technique has its own benefit at each venture level. A hybrid can be a combination of just 2 or maybe more than 5 relying on the developer for this undertaking, a hybrid of rad and FDD was used. RAD made it possible and less complicated to conform as the developer realized at some point the necessities could exchange. FDD made it feasible to attention on all of the capabilities of the system.

3.8 DESIGN

The layout is executed to mirror every procedure that the medical doctor engages in in a normal sanatorium placing in addition to different tactics that the clinic engages in as it regarded that doctor can't simply exist on its very own in a health center. The layout has additionally been executed the usage of hybrid approach.

CHAPTER 4: IMPLEMENTATION

4.1 INTRODUCTION

Advanced healthcare system is a discipline where in accurate record retaining and conversation are vital and but where in the usage of computing and networking era lags at the back of other fields. Healthcare professionals and sufferers are regularly uncomfortable with computer systems, and feel that computers aren't vital to their healthcare venture, even though they agree that accurate document keeping and verbal exchange are important to top health care. The cutting-edge fitness care procedure is quite tedious and time consuming. This is because of the elongated series of sports concerned within the procedure of initial affected person registration, seeing a physician and filing and amassing prescriptions a part of the hassle is likewise due to the as an alternative bad and outdated statistics garage and retrieval machine. There is additionally a number of paper work worried which placed loads of critical information in threat of being destroyed and with a totally bad security.

4.2 REQUIREMENTS

4.3 FUNCTIONAL REQUIREMENTS

Functional requirements explain a characteristic of a system and its additives. It describes the inputs the gadget will accept and the output it will produce. The table below suggests the functional requirement of the gadget.

No	Requirements	Description	Priority
01	User Create	The process must be allow the Admin to user create for the Advanced health care system.	Excellent
02	Changes Password	The process must be allow the Admin to changes password for the Advanced health care system.	Excellent

03	User Management	The process must be allow the Admin to create user management for the Advanced health care	Excellent
04	Login	The provision need to enable customers in accordance with block between with a unique username and password	Excellent
05	User Registration	The process must be able given the admin to user registration.	Excellent
06	Doctor Registration	The process must be able given the admin to doctor registration.	Excellent
07	Patient registration	The process must be able given the admin to patient registration.	Excellent
08	Add Patient Appointment	The process must be able given the admin to add patient registration.	Excellent
09	Patient Diagnoses	The process must be able given the admin to add patient registration	Excellent
10	Lab Billing	The process must be able to calculate the lab billing.	Excellent
11	Pharmacy Billing	The process must be able to calculate the pharmacy billing.	Excellent
12	Diseases	The process must be able to take a proper Diseases.	Excellent

4.4 NON-FUNCTIONAL REQUIREMENTS

Non-Functional requirement do now not provide an explanation for behavior however rather give an explanation for the approaches that can be used to qualify the operations of the gadget. The desk underneath shows the non-useful requirements for the net ordering system.

No.	Requirement Name	Description	Why needed
1	Availability	Hours of Operation- the system should be available 24/7 excerpt maintaining times. Locations of Operation- The process will be available to everyone online.	-To serve students at any time -deliver distance restrictions
2	Security	Have to allow users to login with a unique consumer name and password and restrict some areas to people with authority to access them simplest like the administrator.	Prevent fraud and manipulation of information
3	Performance	Response time- application must load and refresh fast. Processing time- application must	Provide results fast to user

		perform calculations fast. Query and report times- Application must load initial and subsequent loads fast	
4	Capacity	Throughput- the system should be able to handle over 100 transactions per hour Storage- the system should be able to store 300GB of data The system should have room to grow	Amount of items the system can handle can be over capacitated
5	Reliability	Mean time between failures – less than 4,000 hours per year. The system must be reliable. Mean time to recover- if down the system must take less than an hour to recover	Customers need to access the system at all times.
6	Compatibility	The system should be compatible with Shared applications- it should communicate with flash players and web browsers etc	To make the system work on different situations.

		3rd party applications- it should live amicably with antivirus software Operating systems- it should be able to run on window 7 and above, and above, linux and mac OS. Platforms- it should work on different hardware platforms and mobile devices	
7	Maintainability	The system must be easy to maintain, upgrade and grow	For development and error correction
8	Usability	Look and feel- the interface must be user friendly with the colors, text, space, keyboard shortcuts all welcoming for the user.	Easy and simple to use
9	Audit	System should allow auditing of some data elements like payment details	For security reasons.

4.5 FEASIBILITY STUDY

The advanced healthcare gadget is viable in many approaches which can be defined from the subsequent factors.

- ✓ **Response time:** the system has quick statistics get response to so the reaction time may be very much less.
- ✓ **Statistics integrity:** this portal shall have a centralized statistics if you want to be correct.
- ✓ **Reliability:** a system is reliable if it fulfills requirements and recognizes and forestalls errors. This project is dependable for this manner.
- ✓ **Communicativeness:** this system might be accessible via internet.
- ✓ **Environment factor:** the portal will paper because of statistics files stores on hardware. This one decreases air pollutants.
- ✓ **Compatibility:** because the project may be accessible through internet, so it will likely be made to well suit with the standard hardware and software.

4.6 PLATFORM SPECIFICATION

Every assignment needs some tools and programming language that needs to be determined earlier in the course of the evaluation. This undertaking also uses quite a number of system as well as languages which are explained beneath in detail. This undertaking can work on each windows and Linux systems however I'm developing and testing best on windows platform:

4.7 TOOLS USED

- ❖ **Java development kit (JDK)** -> is a tool which is used to development the JAVA SE, JAVA ME, or JAVA software in a system and so on.
- ❖ **Java runtime environment (JRE)** -> this software is used to run the java program on a gadget no longer for development. JDK is critical for improvement so for this

mission both software needs. This project may be required jdk 1.7 and jre 7 and also it depends on the tomcat server.

- ❖ **IntelliJ Idea:** this software is used to put in force the java, jsp or some other programming languages .net application intellij ide for java EE builders can be wanted because that is a web utility. IntelliJ idea is used to enforce this venture.
- ❖ **Tomcat:** this is server which is used to set up the code and output can be seen at the browser. Tomcat 6.zero or above model is required for this undertaking.
- ❖ **MySQL workbench:** this is a database that is used to save the data about the patron or some other statistics at one location and may be accessed without difficulty.
- ❖ **Internet browser:** there are two internet browser to see the output first one inner that's embedded with eclipse and other is outside browser (Google chrome, Firefox and many others).

4.8 LANGUAGES USED

The project makes use of the j2ee platform and a few other technologies can be used for a little painting and some might be used in the course of. The following is a whole list of all technologies and their use inside the venture in detail:

- ❖ **Java** – it is one of the most effective items oriented platform independent language. Java is used in maximum of the projects in one form or another.
- ❖ **JSP** – java server pages or JSP for short is a server-side era that takes java language with its inherent simplicity, and makes use of it to create notably

interactive and bendy web applications. JSP may be used in the assignment to create maximum of the web pages that interact with the consumer.

- ❖ **Java Script** – java script is used for customer- aspect scripting. It permits the web pages to have some programmatic capability in the browser. Java script works with and might control the html web page in which it's far embedded. Java script is used within the venture to validate the facts entered within the web pages by means of the user before it's sent to the server.
- ❖ **Servlet** – a servlet is a java application that generates dynamic internet content material. They are written with the use of the java servlet API and are managed by a servlet field such as tomcat. The servlet processes the person request, builds a reaction, and passes it to the field which is returned to the consumer. I've used a servlet for making the controller primarily inside the web based device. It processes the consumer requests and gives appropriate reaction according to the steps defined.
- ❖ **Html** – html or hypertext markup language is used for developing internet pages. Html pages are static and do not have interaction with the person, however can be made interactive through including JSP elements within them. Most of the internet pages for the challenge are designed in html and after that JSP factors are introduced to them.
- ❖ **Xml** – extensible markup language or xml for quick performance has ended up as the de facto general for records interchange on the internet. We've not used it at once but for a variety of configuration files of apache tomcat server; in addition to apache, James electronic mail server are written on this layout.

PROJECT REQUIREMENTS

HARDWARE REQUIREMENTS	
Processor	Pentium II, Pentium III, Core i3, i5, i7
RAM	2 GB, 4 GB, 8 GB, 16 GB or higher.
Disk Space	500 GB or higher
Operating System	Win- XP, Win-7, Win- 8, Win-10, Linux or higher

4.9 SECURITY ISSUE

Portal is comfortable each patron aspect and server aspect nobody can see the employees' details except admin and manager. Admin and supervisor have extraordinary types of accessibility however earlier than they perform any operation with the employees, they should have a few unique username and password. Care of security is taken for character servers in addition to the entire system. Steps are taken to counter 3 types of protection issues which can be as follows:

- ❖ Unauthorized get admission to database server.
- ❖ Unauthorized get entry to Healthcare system.
- ❖ Steps taken in opposition to hacking of system

4.10 DATA INTEGRITY & VALIDATION CHECKS

Facts integrity may be very crucial in any undertaking due to the fact invalid statistics is of no use so various measures are taken for preserving facts integrity. In net based totally Healthcare device the most critical information for the easy functioning of the device is the records contained of the patient. There are steps for preserving data integrity:

- ❖ Value constraints and tiers
- ❖ Validation checks

4.11 VALUE CONSTRAINTS AND RANGES

Step one for retaining facts integrity is to discover various fee stages of diverse attributes. This is carried out in the layout phase within the healthcare device admin could make

changes to the facts constraints are defined at the facts entered through the admin which can be as follows:

<u>Attribute</u>	<u>Value constraint and range</u>
Username	a-z and number contain the User Name
Password	a-z and number contain the Password
User Type	a-z and number contain and the super user , Admin etc.
First Name	a-z character Only can contains
Last Name:	a-z character Only can contains
Gender	a-z character Only can contains

4.12 VALIDATION CHECKS

Validation assessments are the second step in retaining facts integrity. Those are implemented in the coding phase of the mission development. When the admin enters records validation exams are achieved over it earlier than using it. If it's far found to violate its cost variety then the best message is proven to the admin. The undertaking evolved additionally performs a whole lot of validations at the information entered a number of them are given below:

<u>Attribute</u>	<u>Validation Checks Performed</u>
Username	Is wholly sparing for worth constraints before checking it with the server.
Password	Checked solely at login day in conformity with be more than characters.
User Type	Only administrator may hand over someone User Type

CHAPTER 5: SYSTEM DESIGN

4.13 SYSTEM ANALYSIS AND DESIGN

- ❖ **Output:** the undertaking is created for report and printouts as output of the portal's all static or dynamic internet pages.
- ❖ **Inputs:** enter of the project via shape of java servlets under the subsequent points.
- ❖ **Accuracy:** information will be continually correct because statistics input via textbox and mixture box with constant length and statistics type additionally. Wrong information now not conventional through the venture due to the fact every subject makes use of facts validation.
- ❖ **Timeliness:** records is get right of entry to very fast because the database is MySQL and now not complicated calculation present in the task.
- ❖ **Right layout:** for proper format enter and output html, front page and java servlet are used.

4.14 SYSTEM DESIGN

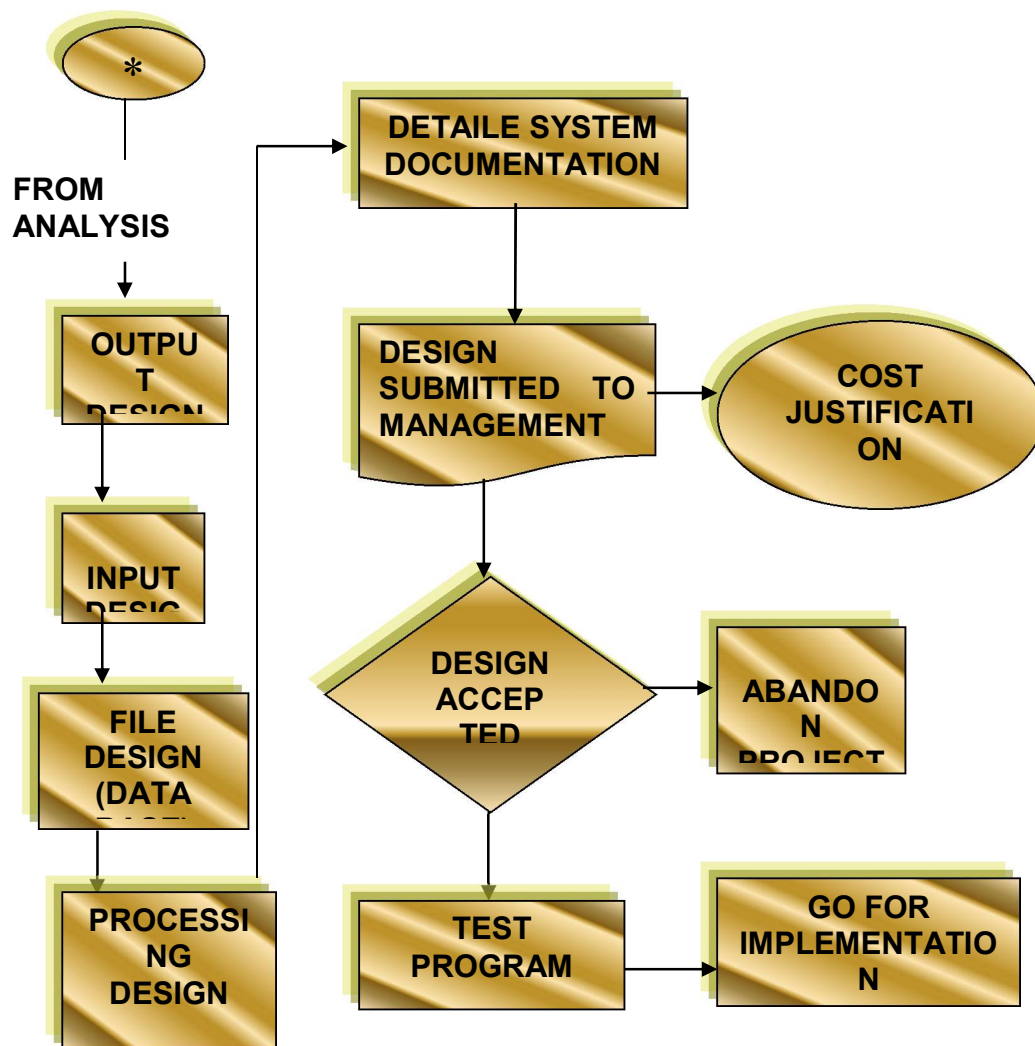


Figure 11: System Design

4.15 DATA FLOW DIAGRAMS

A statistics drift diagram is a graphical illustration that depicts facts go with the flow and the transformations which is probably achieved as records flow into from input to output. The DFD can be partitioned into stages that represent increasing statistics go with the flow and practical element.

LOGIN PROCESS

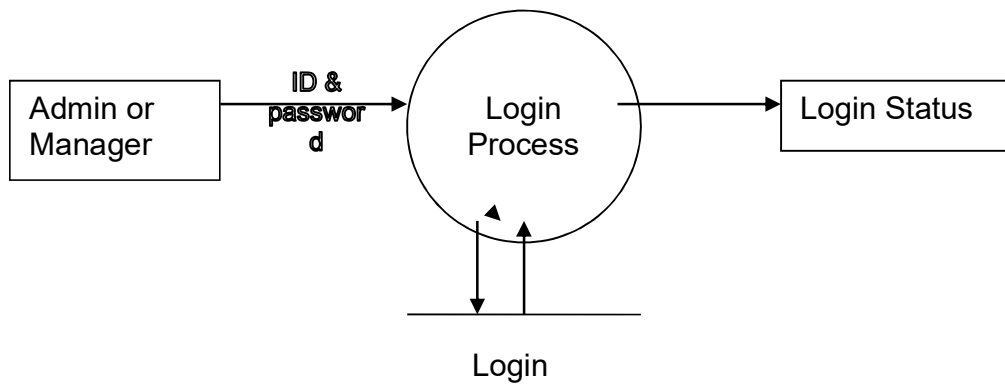


Figure 12: Login Process

LOGOUT PROCESS

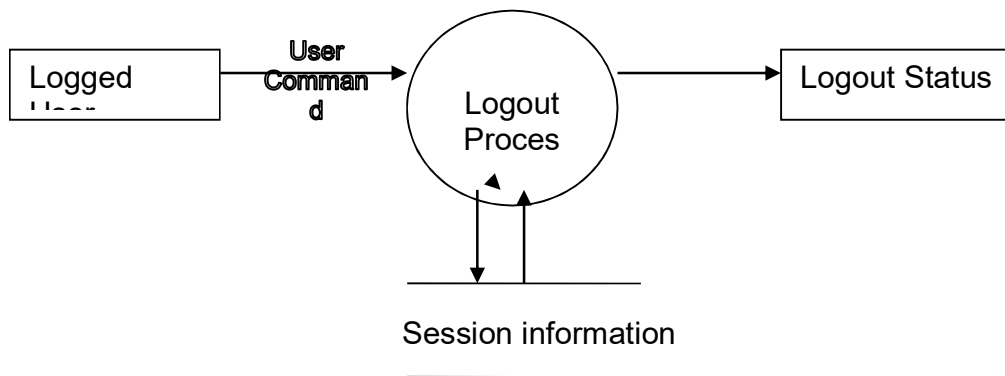


Figure 13: Logout Process

4.16 USE CASE DIAGRAM



LIST OF USE CASES

Use case name	Use case Description	Actor
Log in	The device must allow users to log in with a completely unique username and password	Admin (primary business) Manager (primary business)
Logout	This use case destroys logged in users session	Admin (primary business) Manager (primary business)
User Registration	The use case lets in the admin to user registration to the healthcare system.	Admin (primary business)
Doctor Registration	The use case lets in the admin to Doctor registration to the healthcare system.	Admin (primary business)

Use case name	Use case Description	Actor
Patient Registration	The use case lets in the admin to Patient registration to the healthcare system.	Admin (primary business)
Add Patient Appointment	The use case lets in the admin to Add patient registration to the healthcare system.	Admin (primary business)
Diagnoses	The use case lets in the admin to Diagnoses to the healthcare system.	Admin (primary business)
Diseases	The use case lets in the admin to Diseases to the healthcare system.	Admin (primary business)

4.17 CLASS DIAGRAM

Class diagram provides an outline of the target gadget via describing the items and instructions in the device and the relationships among them (visual-paradigm.com, n.d.). In the magnificence diagram they are two primary users of the system manipulate and the administrator. Each of this lessons inherit attributes from the user extraordinary class. The administrator interacts with all of the different lessons at the same time as manipulate can only view reviews.

UML Class Model

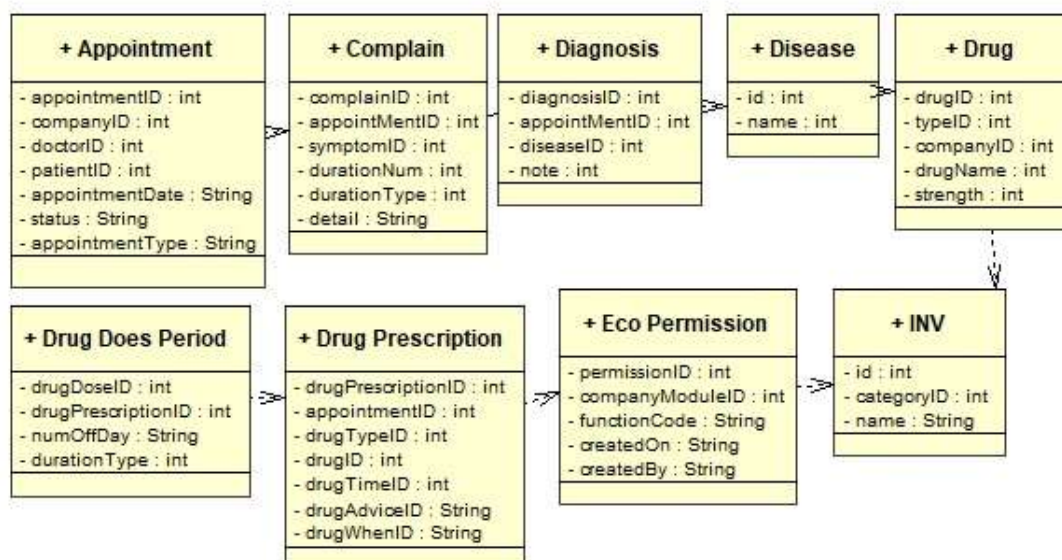


Figure 14: Class Diagram

4.18 IMPLEMENTATION

There are two accounts inside the home page of the Advanced healthcare system which is distinctive roles and most effective valid consumer can get entry to these accounts owed and perform some movements.

- ❖ Admin Account
- ❖ Manager Account


4.19 ADMIN ACCOUNT

After coming into the legitimate username and password, admin can carry out these movements:

- ❖ Admin Login
- ❖ Admin Menu
- ❖ Hospital Setup
- ❖ User Management
- ❖ User Permission
- ❖ Doctor Registration
- ❖ Patient Registration
- ❖ Add New Patient
- ❖ Doctor Prescription
- ❖ Add Patient Complain
- ❖ Add patient Diagnosis
- ❖ Add Patient Drugs
- ❖ Add Patient INV
- ❖ Diseases Report

4.20 ADMIN LOGIN

This system is extra secure and if the consumer enters an incorrect person identification and password or depart the clean space it's going to display the error handiest legitimate admin can get entry to this account.



The image shows a login form with a light blue background. It contains two input fields: 'User name' with a blue gear icon and 'Password' with a red padlock icon. An orange 'Log In' button is to the right. Below the fields is a message: 'Full authentication is required to access this resource.'

Figure 15: Admin Login

4.21 ADMIN MENU

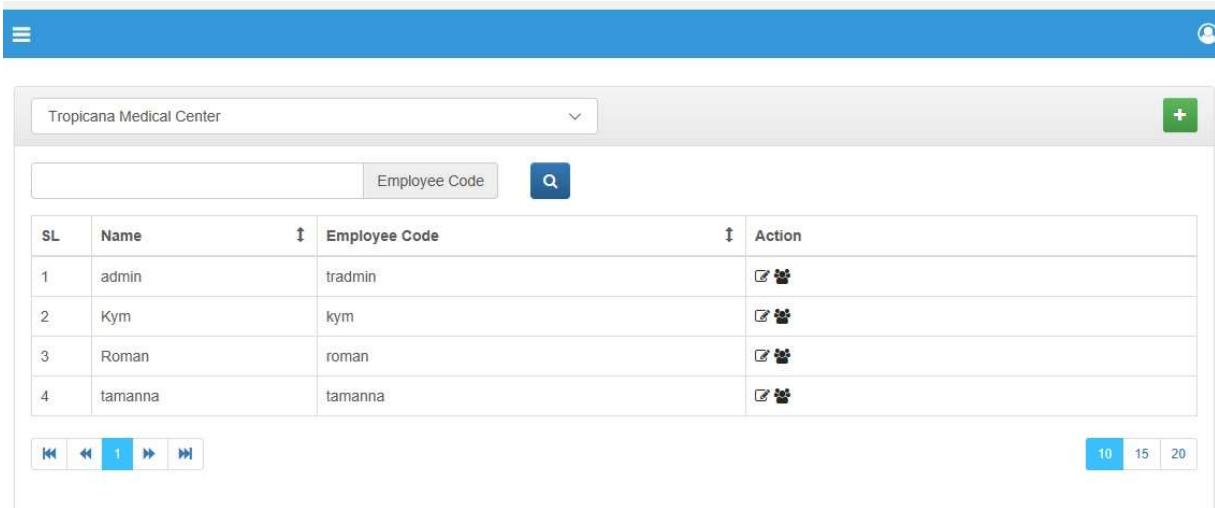
After successfully login admin can perform distinct actions which are showing inside the health care system menu.











Figure 16: Admin menu

4.23 HOSPITAL SETUP

This is the domain in which health center data, in addition to employee management, amongst different things are performed. In this application, doctors are treated as employee even as developing health center facts as there is a choice to create dynamic fields for every sanatorium with a purpose to save some particular statistics about all medical doctors which they could use later on to test what's the physician's choice.



The screenshot shows a web application interface for 'Hospital Setup'. At the top, there is a blue header bar with a menu icon on the left and a user profile icon on the right. Below the header, a dropdown menu is set to 'Tropicana Medical Center'. A search bar labeled 'Employee Code' with a magnifying glass icon is present. The main content area features a table with the following data:

SL	Name	Employee Code	Action
1	admin	tradmin	 
2	Kym	kym	 
3	Roman	roman	 
4	tamanna	tamanna	 

At the bottom of the table, there are pagination controls showing '1' of 20 items, and a status bar indicating '10', '15', and '20' items per page.

Figure 17: Hospital Setup

4.24 USER MANAGEMENT

The user management panel allows user to control records regarding to user as well as consumer account view, password reset and password change.

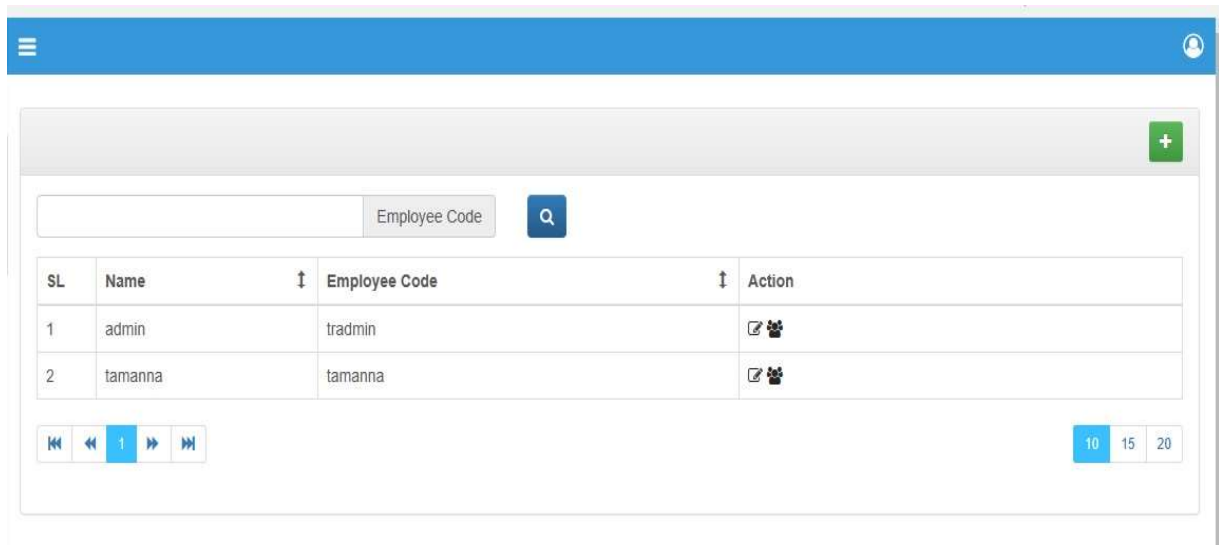


Figure 18: User Management

4.25 USER PERMISSION

This panel permits the device to be configured to seek permission for the functionalities which include machine configuration, subject configuration as well as e-mail configuration for standard use.

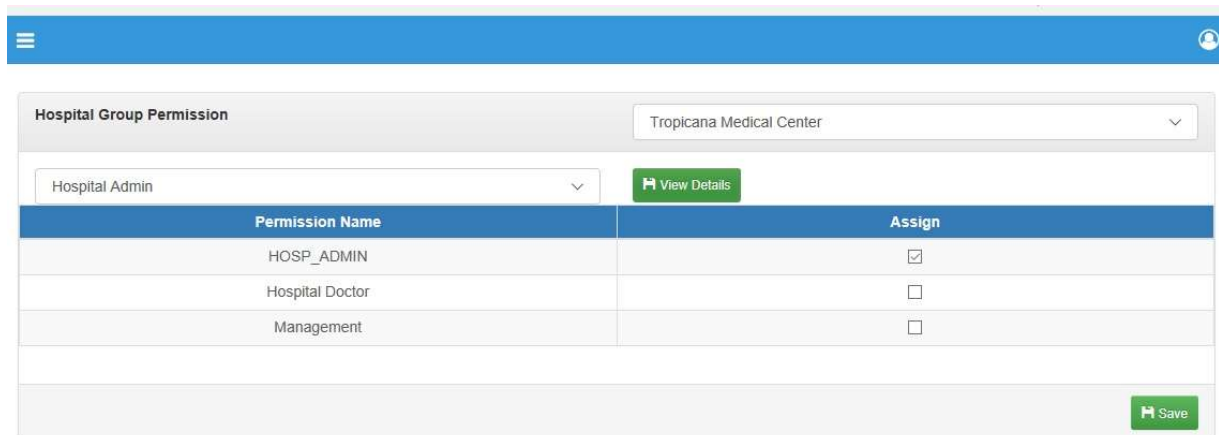
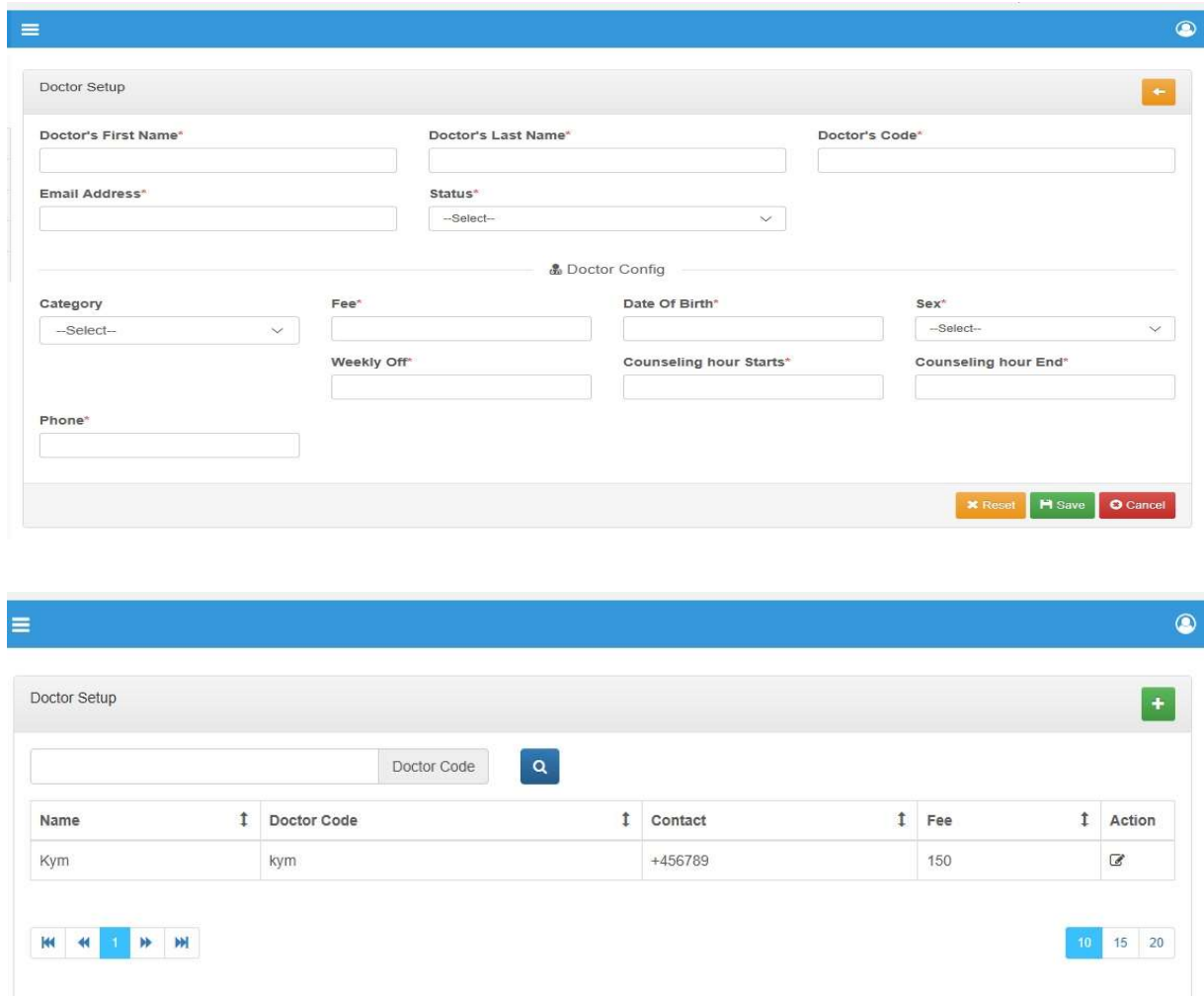


Figure 19: User Permission

4.26 DOCTOR REGISTRATION

This system is very important for doctor registration because patients can have registration for their doctor. If there is any change in their registration data, Patient can change and update such data.



The image shows two screenshots of a web application interface for doctor registration.

The top screenshot shows the "Doctor Setup" form. It has a blue header bar with a menu icon and a user profile icon. The form is titled "Doctor Setup" and has a back arrow button. The form fields are:


- Doctor's First Name* (text input)
- Doctor's Last Name* (text input)
- Doctor's Code* (text input)
- Email Address* (text input)
- Status* (dropdown menu with "--Select--")
- Category (dropdown menu with "--Select--")
- Fee* (text input)
- Date Of Birth* (text input)
- Sex* (dropdown menu with "--Select--")
- Weekly Off* (text input)
- Counseling hour Starts* (text input)
- Counseling hour End* (text input)
- Phone* (text input)

At the bottom right of the form are three buttons: "Reset" (orange), "Save" (green), and "Cancel" (red).

The bottom screenshot shows the "Doctor Setup" table. It has a blue header bar with a menu icon and a user profile icon. The table is titled "Doctor Setup" and has a green "+" button. The table has a search bar with the text "Doctor Code" and a search icon. The table columns are:

- Name
- Doctor Code
- Contact
- Fee
- Action

The table contains one row of data:

Name	Doctor Code	Contact	Fee	Action
Kym	kym	+456789	150	

At the bottom of the table are two pagination controls. The first control shows "1" of 1 pages. The second control shows "10 15 20" items per page.

Figure 20: Doctor Registration

4.27 PATIENT REGISTRATION

This system is very important for Patient registration because patient can have registration for his doctor's schedule. If any changes his registration data Patient can change and update his data.

The top screenshot shows the 'Patient Setup' form. It has a blue header bar with a menu icon and a user profile icon. The form is titled 'Patient Setup' and has a back arrow icon. The form contains the following fields:

- Patient's First Name*
- Patient's Last Name*
- Patient's Code*
- Email Address
- Status* (dropdown menu with '--Select--')
- Date Of Birth*
- Sex* (dropdown menu with '--Select--')
- Address*
- Phone*
- Occupation* (dropdown menu with '--Select--')

At the bottom right of the form are three buttons: 'Reset' (orange), 'Save' (green), and 'Cancel' (red).

The bottom screenshot shows the 'Patient Setup' form with a search bar and a table of registered patients. The search bar has a 'Patient Code' label and a search icon. The table has the following columns: Name, Contact, and Action. The table contains one row with the name 'Roman' and contact '123'. The Action column has an edit icon. At the bottom of the table are pagination controls showing '1' of 20 items, with buttons for '10', '15', and '20' items per page.

Figure 21: Patient Registration

4.28 ADD NEW PATIENT

This system is very important for Adding New Patient registration because new patient can have registration for his doctor's schedule. For a New Patient, if any changes are there in his registration data, Patient can change and update his data.

Add New Patient

Doctor Name: *

Patient Name: *

Date: *

Time: *
 :

Appointment Type: *

Figure 22: Add New Patient

4.29 DOCTOR PRESCRIPTION

This system is very important for a Patient because when a Patient has completed his doctor registration then the doctor see the patient data and doctor provide some suggestion like some diagnosis, RX, investigation as well as prescription. When a doctor will be completed his prescription then he can do a print this page. Doctor can do the save the data as well as update and delete also.

HOSPITAL

Name: Raj Phone: 04234244 Date of birth : 21/05/1997 Sex: MALE

Prescription

Chief Complaints

Investigation

Clinical Note

On Examination

Clinical Record

Next Visit

Next Visit Date

Diagnosis :

RX

Advice

Figure 23: Doctor Prescription

4.30 ADD PATIENT COMPLAIN

This system is very important for doctor when a doctor make a prescription for his patient then the doctor use this.

The 'Add Complain' form is a web-based interface for recording patient symptoms. It features a light green header with the title 'Add Complain'. Below the header, there are four rows, each representing a symptom. Each row contains three input fields: a text box for the symptom name, a dropdown menu for the duration in days, and a dropdown menu for the duration type. The symptoms listed are 'Excessive Sweating', 'Dyspnoea', 'Weakness', and 'Gliddiness'. The durations are 6, 10, 13, and 16 days respectively. The duration types are 'Year', 'Month', 'Month', and 'Month'. At the bottom right, there are two buttons: a green 'Save' button and a red 'Cancel' button.

Symptom	Duration Day	Duration Type
Excessive Sweating	6	Year
Dyspnoea	10	Month
Weakness	13	Month
Gliddiness	16	Month

Figure 24: Add Patient Complain

4.31 ADD PATIENT DIAGNOSIS

This system is very important for doctor when a doctor make a prescription for his patient then the doctor give some diagnosis use this form.

The 'Add Diagnosis' form is a web-based interface for recording patient diagnoses. It features a light green header with the title 'Add Diagnosis'. Below the header, there is a text box for the diagnosis name, which currently contains the letter 's'. A dropdown menu is open, showing a list of medical conditions: 'Viral hepatitis', 'Constipation', 'Heart Disease', 'ISCHAEMIA', 'SPONDALITIES', 'IBS', 'CHOLECYSTITIES', 'CHOLELETHIASIS', 'CYSTITIES', and 'PROSTATITIS'. At the bottom right, there are two buttons: a green 'Save' button and a red 'Cancel' button. Below the form, there is a section labeled 'Advice'.

Diagnosis Name
s

- Viral hepatitis
- Constipation
- Heart Disease
- ISCHAEMIA
- SPONDALITIES
- IBS
- CHOLECYSTITIES
- CHOLELETHIASIS
- CYSTITIES
- PROSTATITIS

Figure 25: Add Patient Diagnosis

4.32 ADD PATIENT DRUGS

This system is very important for doctor when a doctor make a prescription for his patient then the doctor give some Drugs use this form.

The 'Add Drugs' form includes a dropdown menu for selecting drug types: Tablet, Capsule, Syrup, Injection, Suppository, Insulin, Drop, Cream, Inhaler, IV-infusion, Spray, Powder for Suspension, GEL, Solution, Pellets, Oral Paste, Ointment, Aerosol Inhalation, Lotion, Raw Materials, Hand Rub, Mouth Wash, Oral Saline, Elixir, Bolus, Sachet, Sachet Powder, Emulsion, Shampoo, and Vaccine. The form also has a 'Drug Name *' text field, a 'When' dropdown menu (After Meal), a 'Duration num' dropdown menu (7), and a 'Duration Type' dropdown menu (Days). At the bottom right, there are 'Save' and 'Cancel' buttons.

Figure 26: Add Patient Drugs

4.33 ADD PATIENT INV

This system is very important for doctor when a doctor make a prescription for his patient then the doctor give some investigation test use this form.

The 'Add Inv' form includes a text field for 'Inv Name:' with a dropdown menu showing various investigation tests: Venous-(pCO2), Partial pressure of oxygen (pO2), pH Venous, Glycosylated Hemoglobin (HbA1c), Oral Glucose Tolerance Test (GTT), Post Prandial Blood Sugar (PP - 2 hours), Random Blood Sugar (RBS), Prostate Specific Antigen (PSA), Serum Amylase, and Serum anti_La(SS_B). At the bottom right, there are 'Save' and 'Cancel' buttons.

Figure 27: Add Patient INV

4.34 DISEASES REPORT

This system is very important for both doctor and patient when a doctor make a prescription for his patient then the doctor give some investigation test and gives some important suggestions as well as provide a full prescription use this form. Finally Doctor can make print a report for his patient.

Heart Disease	
STERADIN	1
DIFLU STERILE	1
Haemoptysis	1
Hiccups	1
Jaundice	2
Gliddiness	4

Figure 28: Diseases Report

CHAPTER 6: TESTING

4.35 TESTING

Testing is a fashionable technique that is completed to check any device that should were evolved. The kind of testing depends on the type of device that has been built. For this project, three sorts of testing could be used

❖ Unit Testing

The unit testing may be completed so as to test every unit of the system to ensure they paintings the manner they had been programmed

❖ Black box testing

This will be carried out to see how customers respond to using the system for the primary time without earlier understanding of what the system does

❖ User Acceptance Testing

This may be completed with the aid of prospective person to peer if it has met necessities and may be incorporated into the environment for which it has been advanced.

4.36 LEGEND

A lot of symbols are used in the testing data and reports which are given as follows:

- | | | | |
|----|-----|---|-----------------------------|
| 1. | N/A | : | Not Applied. |
| 2. | A | : | Apply |
| 3. | S | : | Select this field. |
| 4. | BFP | : | Blank Field Prohibited. |
| 5. | BFA | : | Blank Field can be applied. |
| 6. | MBE | : | Must Be Existing. |
| 7. | EMA | : | Error Message Appeared. |
| 8. | D | : | Default Value |

4.37 TESTING TECHNIQUE

UNITE TESTING

The unit testing turned into carried out for all of the capabilities and functionalities of the system. The details are given beneath

UNIT TESTING OVERALL RESULT			
S.No .	Module Description	Result	Successful/Failed
1	Login Admin	As Expected	Successful
2	Login Manager	As Expected	Successful
3	User Management	As Expected	Successful
4	User Permission	As Expected	Successful
5	Search Record	As Expected	Successful
6	Save Record	As Expected	Successful
7	Doctor Registration	As Expected	Successful
8	Patient Registration	As Expected	Successful
9	Add New Patient	As Expected	Successful
10	Inv Request	As Expected	Successful
11	Diseases	As Expected	Successful
12	Logout	As Expected	Successful
UNIT Test Case Status:			Successful

MODULE NAME: ADMIN LOGIN

ARRAY OF VALUES								
Field Name	Blank Entry	Numeric Entry	Alphabet Entry	@ Entry	Special Symbol	Expected Result	Observed Result	Test Result
Username	BFP	N/A	A	N/A	N/A	EMA	EMA	Pass
Password	BFP	A	A	N/A	N/A	EMA	EMA	Pass
Module Test Status:							Successful	

Figure 29: Admin Login Testing

MODULE NAME: MANAGER LOGIN

ARRAY OF VALUES								
Field Name	Blank Entry	Numeric Entry	Alphabet Entry	@ Entry	Special Symbol	Expected Result	Observed Result	Test Result
Username	BFP	N/A	A	N/A	N/A	EMA	EMA	Pass
Password	BFP	A	A	N/A	N/A	EMA	EMA	Pass
Module Test Status:							Successful	

Figure 30: Manager Login Testing

MODULE NAME: DOCTOR REGISTRATION

ARRAY OF VALUES								
Field Name	Blank Entry	Numeric Entry	Alphabet Entry	@ Entry	Special Symbol	Expected Result	Observed Result	Test Result
Doctor First Name	BFP	A	A	N/A	N/A	EMA	EMA	Pass
Doctor Last Name	BFP	N/A	A	N/A	N/A	EMA	EMA	Pass
Doctor Code	BFP	N/A	A	N/A	N/A	EMA	EMA	Pass
Email	BFP	N/A	S	N/A	N/A	EMA	EMA	Pass
Status	BFP	S	N/A	N/A	N/A	EMA	EMA	Pass
Category	BFP	A	A	A	A	EMA	EMA	Pass
Fee	BFP	A	N/A	N/A	N/A	EMA	EMA	Pass
Date of Birth	BFP	A	A	A	A	EMA	EMA	Pass
Sex	BFP	N/A	S	N/A	N/A	EMA	EMA	Pass
Weekly off	BFP	N/A	S	N/A	N/A	EMA	EMA	Pass
Counseling hour	BFP	D	N/A	N/A	N/A	EMA	EMA	Pass
Phone	BFP	S	N/A	N/A	N/A	EMA	EMA	Pass
Module Test Status:							Successful	

Figure 31: Doctor Registration Testing

MODULE NAME: PATIENT REGISTRATION

ARRAY OF VALUES								
Field Name	Blank Entry	Numeric Entry	Alphabet Entry	@ Entry	Special Symbol	Expected Result	Observed Result	Test Result
Patient First Name	BFP	A	A	N/A	N/A	EMA	EMA	Pass
Patient Last Name	BFP	N/A	A	N/A	N/A	EMA	EMA	Pass
Patient Code	BFP	N/A	A	N/A	N/A	EMA	EMA	Pass
Email	BFP	N/A	S	N/A	N/A	EMA	EMA	Pass
Status	BFP	S	N/A	N/A	N/A	EMA	EMA	Pass
Date of Birth	BFP	A	A	A	A	EMA	EMA	Pass
Sex	BFP	N/A	S	N/A	N/A	EMA	EMA	Pass
Address	BFP	N/A	S	N/A	N/A	EMA	EMA	Pass
Occupation	BFP	D	N/A	N/A	N/A	EMA	EMA	Pass
Phone	BFP	S	N/A	N/A	N/A	EMA	EMA	Pass
Module Test Status:							Successful	

Figure 32: Patient Registration Testing

MODULE NAME: ADD NEW PATIENT

ARRAY OF VALUES								
Field Name	Blank Entry	Numeric Entry	Alphabet Entry	@ Entry	Special Symbol	Expected Result	Observed Result	Test Result
Doctor Name	BFP	A	A	N/A	N/A	EMA	EMA	Pass
Patient Name	BFP	N/A	A	N/A	N/A	EMA	EMA	Pass
Date	BFP	N/A	A	N/A	N/A	EMA	EMA	Pass
Time	BFP	N/A	S	N/A	N/A	EMA	EMA	Pass
Appointment	BFP	S	N/A	N/A	N/A	EMA	EMA	Pass
Module Test Status:							Successful	

*Figure 33: Add New Patient Testing***4.38 BLACK BOX TESTING**

The black box testing out became carried out to look how users reply to the use of the gadget for the primary time without previous expertise of what the device does. A complete of 15 correspondence participated and the consequences is given beneath:

Criteria/ Tester	Design	Layout	Navigation	Content	Interactivity
1	4	4	4	5	4
2	4	4	4	4	4
3	5	4	4	4	4
4	4	4	4	4	4
5	4	4	4	4	4
6	5	4	4	4	4
7	4	4	4	4	4
8	5	4	5	5	4
9	4	4	5	4	4
10	5	4	4	4	4
11	4	4	4	4	4
12	4	4	4	4	4
13	5	4	4	4	4
14	4	4	3	4	4
15	5	3	4	4	4
Total	78/90	70/90	73/90	74/90	71/90
Percentage	87%	78%	81%	82%	79%
Average Percentage = 81.4%					
Percentage Pass = 74%					
Keys: 5 = Excellent 4 = Very Good 3 = Good 2 = Average 1 = Fair					

Figure 34: Black Box Testing

4.39 USER ACCEPTANCE TESTING

The user acceptance testing as completed by way of prospective consumer to peer if it has met necessities and may be incorporated into the environment for which it's been developed. A total of 11 correspondence participated and the results are given underneath:

Criteria/ User	System Logic	System Response	System Architecture	System Flexibility	Ease of Use
1	4	4	4	4	5
2	4	4	4	4	5
3	4	4	4	4	4
4	4	4	5	4	5
5	4	4	4	4	4
6	4	4	4	4	5
7	4	4	4	4	4
8	4	4	4	4	5
9	4	4	5	4	5
10	3	4	4	4	5
11	4	4	4	4	4
Total	43/55	44/55	46/55	44/55	51/55
Percentage	78%	80%	84%	80%	93%
Average Percentage = 83%					
Percentage Pass = 80%					
Keys: 5 = Very Good 4 = Good 3 = Average 2 = Fair 1 = Poor					

Figure 35: User Acceptance Testing

4.40 JUSTIFICATION AND TEST PLAN

The unit testing into chosen for you to be able to check every unit of the gadget earlier than thinking about deployment. This offers the user the hazard to debug every mistakes the device may have. The black box trying out enables the developer to take a look at how consumer feels while the usage of the device for the first time with no information of what it does and the way it is supposed to work.

That is very critical because it allows the developer gather info, approximately, such issues including ease of use, navigation and interactivity. The person acceptance is to interact the potential customers to check the machine with prior expertise of the way.

4.41 STANDARDS CODING

(Mytton, 2004) stated in his article that first-rate programs are coded properly. He then went directly to explain that “well” does no longer best suggest the code does its job, however it's also easy to hold, upload to and debug. Coding requirements report what builders must do even as writing there code. In preference to following man or woman's ways of coding, all builders will observe a preferred manner. Different developers who look the code understand what to anticipate via the complete utility (Mytton, 2004). I have attached some standard coding screen shot below:

```

1 package com.raydar.common;
2
3 import java.sql.*;
4
5
6
7
8
9
10 public class SQL2OConnection {
11
12     private static SQL2OConnection instance = null;
13     private static Connection dbConnectionInstance = null;
14
15     public Sql2o sql2o = null;
16
17     //Using DataSource
18     protected SQL2OConnection() {
19
20         try {
21             Class.forName("com.mysql.jdbc.Driver").newInstance();
22             DataSource datasource = (DataSource) new InitialContext().lookup(
23                 "jdbc:mysql://localhost:3306/echo_company_module");
24             sql2o = new Sql2o(datasource);
25             dbConnectionInstance = sql2o.open();
26
27         } catch (Exception ex) {
28             ex.printStackTrace();
29         }
30     }
31
32     public static SQL2OConnection getInstance() {
33         if (instance == null) {
34             instance = new SQL2OConnection();
35         }
36     }
37 }

```

Figure 36: Databases Connection

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <!DOCTYPE mapper PUBLIC "-//mybatis.org//DTD Mapper 3.0//EN"
3     "http://mybatis.org/dtd/mybatis-3-mapper.dtd">
4
5 <mapper namespace="com.raydar.mybatis.persistence.echo.CompanyModuleMapper">
6
7     <insert id="create" parameterType="CompanyModule" useGeneratedKeys="true">
8
9         INSERT INTO `echo_company_module`
10         (
11             `companyID`,
12             `shortName`,
13             `moduleID`,
14             `updatedOn`,
15             `updatedBy`,
16             `createdOn`,
17             `createdBy`
18         )
19         VALUES
20         (
21             #{companyID},
22             #{shortName},
23             #{moduleID},
24             #{updatedOn},
25             #{updatedBy},
26             #{createdOn},
27             #{createdBy}
28         )
29     </insert>
30
31 </mapper>

```

Figure 37: MySQL Quire

```

1 package com.raydar.common.audit;
2
3 import com.raydar.mybatis.domain.EchoUserDetail;
4
5
6 public class CallerPrinciple {
7
8     private static final ThreadLocal<EchoUserDetail> userThreadLocal = init();
9
10    public static EchoUserDetail getUser() { return userThreadLocal.get(); }
11
12    public static String getUsername() {
13        EchoUserDetail echoUserDetail = getUser();
14        return echoUserDetail == null ? "anonymous" : echoUserDetail.getUserName();
15    }
16
17    public static void setUser(EchoUserDetail echoUserDetail) { userThreadLocal.set(echoUserDetail); }
18 }

```

Figure 38: Java Code

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <!DOCTYPE mapper PUBLIC "-//mybatis.org//DTD Mapper 3.0//EN"
3 "http://mybatis.org/dtd/mybatis-3-mapper.dtd">
4
5 <mapper namespace="com.raydar.mybatis.persistence.appointment.AppointmentMapper">
6
7
8
9
10    <select id="getAppointmentInfoByParam" parameterType="map" resultType="AppointmentInfo">
11        SELECT
12            app.appointmentInfoID,
13            app.appointmentID,
14            app.itemType,
15            app.itemID,
16            app.itemDescription
17        FROM `appointment_info` app
18
19        WHERE 1 = 1
20        <if test="appointmentID != null">
21            AND app.appointmentID = #{appointmentID}
22        </if>
23        <if test="itemType != null">
24            AND app.itemType = #{itemType}
25        </if>
26        <if test="offset != null and limit != null and sortColumn != null">
27            ORDER BY #{sortColumn} #{sortOrder}
28            LIMIT #{limit} OFFSET #{offset}
29        </if>
30    </select>
31
32    <select id="getAppointmentInfoByParam" parameterType="map" resultType="AppointmentInfo">

```

Figure 39: Java XML File

	drugID	typeID	companyID	drugName	strength
1	1	1	1	TAMINO	120 mg / 5m
2	2	3	1	TAMINO	665 mg
3	3	1	1	TAMINO ER	5 mg/5ml
4	4	3	1	ARCET	10mg
5	5	1	1	ARCET	200 mg/5 ml
6	6	3	1	VERMIKIL	400 mg
7	7	1	1	VERMIKIL	15 mg/5 ml
8	8	3	1	BROCULYT	200 mg/5 ml
9	9	9	1	FLORAZOL	400 mg
10	10	1	1	FLORAZOL	20 mg
11	11	3	1	AVATOR	50mg/5ml
12	12	3	1	V4Z	200 mg
13	13	3	1	POLYTAMIN	400 mg
14	14	2	1	FICS	100 mg / 5 ml
15	15	2	1	FICS	250 mg
16	16	15	1	FICS	500 mg
17	17	1	1	ROXCEF	250 mg
18	18	1	1	ROXCEF	500 mg
19	19	15	1	FLOROCIN	250 mg
20	20	1	1	FLOROCIN	500 mg
21	21	2	1	VURDOAN SR	100 mg
22	22	1	1	GLUCOMIN	500 mg
23	23	1	1	GLUCOMIN	850 mg
24	24	1	1	DIAZID	80 mg
25	25	1	1	FEXTEN	120 mg
26	26	9	1	FEXTEN	30 mg/5ml
27	27	1	1	STEVIA	100 mg

Figure 40: Data Set

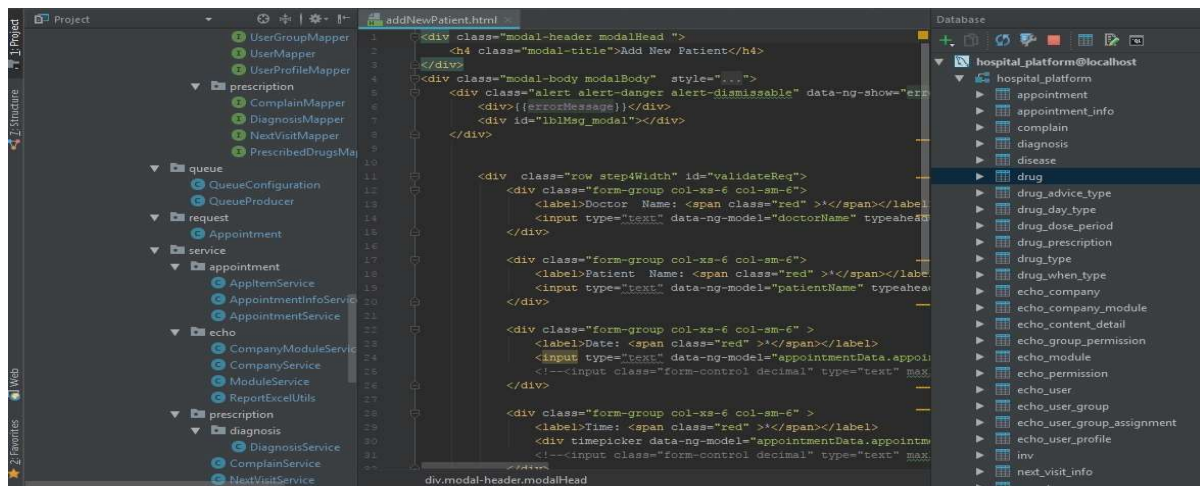


Figure 41: Java HTML

```

val Array(topics, topic) = args
val sparkConf = new SparkConf().setAppName("UberStream")
val producerConf = new ProducerConf(
  bootstrapServers = brokers.split(",").toList
)
// Create direct kafka stream with brokers and topics
val topicsSet = topics.split(",").toSet
val kafkaParams = Map[String, String](
  ConsumerConfig.BOOTSTRAP_SERVERS_CONFIG -> "maprdemo:9092",
  ConsumerConfig.GROUP_ID_CONFIG -> "sparkApplication",
  ConsumerConfig.KEY_DESERIALIZER_CLASS_CONFIG ->
    "org.apache.kafka.common.serialization.StringDeserializer",
  ConsumerConfig.AUTO_OFFSET_RESET_CONFIG -> "earliest",
  ConsumerConfig.VALUE_DESERIALIZER_CLASS_CONFIG ->
    "org.apache.kafka.common.serialization.StringDeserializer",
  ConsumerConfig.ENABLE_AUTO_COMMIT_CONFIG -> "true",
  "spark.kafka.poll.time" -> "10000",
  "spark.streaming.kafka.consumer.poll.ms" -> "8192"
)

```

Figure 42: Map Reduce Code

CHAPTER 7: ANALYSIS

5.1 INTRODUCTION

The research methodology completed earlier was done to collect facts that might assist in shaping the proposed system. The results from the exercise had been analyzed and the information are given in the form of evaluation.

5.2 QUESTIONNAIRE

Questionnaires are part of undetermined question where we target to collect opinion from the prospective user. Lot of thing should be considering during research it help us to consider those thing before a system being develop. To get prospective user's opinion of their respective expectation of the system a list of structured questions have been package in order

1. Have you ever used web healthcare system before?

- A. Yes ☐
- B. No ☐
- C. Once ☐
- D. Often ☐
- E. Never ☐

2. Have you ever used a system same big data in healthcare System?

- A. Yes ☐
- B. No ☐
- C. Once ☐
- D. Often ☐
- E. Never ☐

3. Do you think in Bangladesh there is a need for this kind of system in healthcare?

- A. Totally Agree ☐
- B. Agree ☐
- C. Normal ☐

- D. Disagree []
- E. Totally Disagree []
4. Regarding the cost do you consider it's strategic for any healthcare help to fund the growth and able to achieve the Big Data System in healthcare?
- A. Totally Agree []
- B. Agree []
- C. Normal []
- D. Disagree []
- E. Totally Disagree []
5. Regarding healthcare management, do you think implementing a system like Big Data in health care desirable?
- A. Totally Agree []
- B. Agree []
- C. Normal []
- D. Disagree []
- E. Totally Disagree []
6. Do you think implementing a system like Big Data reduce the cost per head of our population?
- A. Totally Agree []
- B. Agree []
- C. Normal []
- D. Disagree []
- E. Totally Disagree []
7. Do you think personnel face difficulties due to developing Big Data system in healthcare?
- A. Totally Agree []
- B. Agree []

- C. Normal ☐
 - D. Disagree ☐
 - E. Totally Disagree ☐
8. Do you think by implementing Big Data system our healthcare will get benefit?
- A. Totally Agree ☐
 - B. Agree ☐
 - C. Normal ☐
 - D. Disagree ☐
 - E. Totally Disagree ☐
9. Do you think implementing Big Data system our healthcare will not get any benefit?
- A. Totally Agree ☐
 - B. Agree ☐
 - C. Normal ☐
 - D. Disagree ☐
 - E. Totally Disagree ☐
10. Do you think implementing a system like Big Data in our healthcare system makes it easier to manage healthcare general information?
- A. Totally Agree ☐
 - B. Agree ☐
 - C. Normal ☐
 - D. Disagree ☐
 - E. Totally Disagree ☐
11. Do you think managing our healthcare general information become harder due to implementing Big data system in healthcare
- A. Totally Agree ☐
 - B. Agree ☐

- C. Normal []
 - D. Disagree []
 - E. Totally Disagree []
12. Do you think Big Data system is safe enough to handle information?
- A. Totally Agree []
 - B. Agree []
 - C. Normal []
 - D. Disagree []
 - E. Totally Disagree []
13. Do you think by implementing Big Data in our healthcare system will improve healthcare personnel performance?
- A. Totally Agree []
 - B. Agree []
 - C. Normal []
 - D. Disagree []
 - E. Totally Disagree []
14. Do you think personnel get more motivation due to implementing Big Data system?
- A. Totally Agree []
 - B. Agree []
 - C. Normal []
 - D. Disagree []
 - E. Totally Disagree []
15. What is your assumption regarding establish Big Data in healthcare system?
- A. It should be a very sophisticated system
 - B. It should be a straightforward but inclusive system
 - C. It should be a system with features that covers overall healthcare system

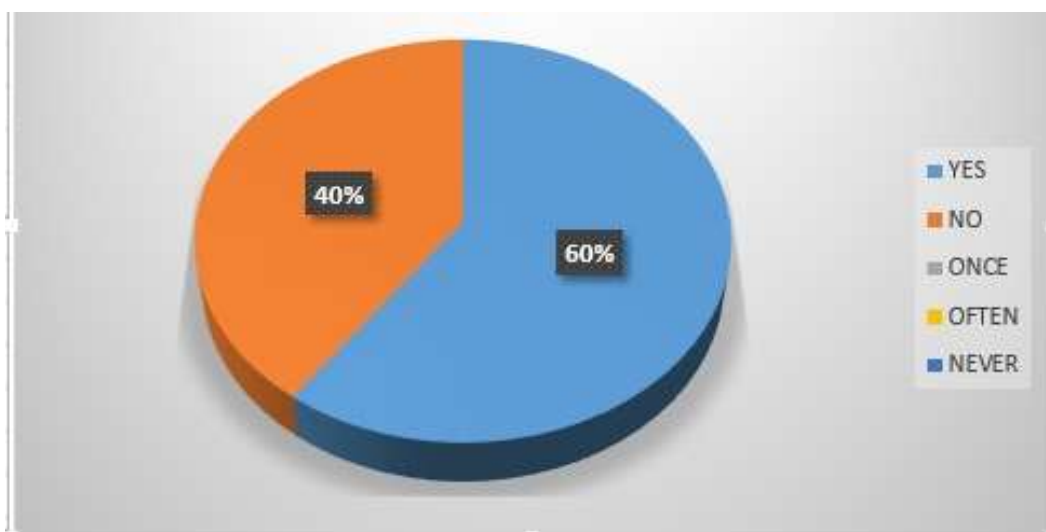
D. It would like other type of system with general features to improve healthcare

E. It should be help to reduce cost

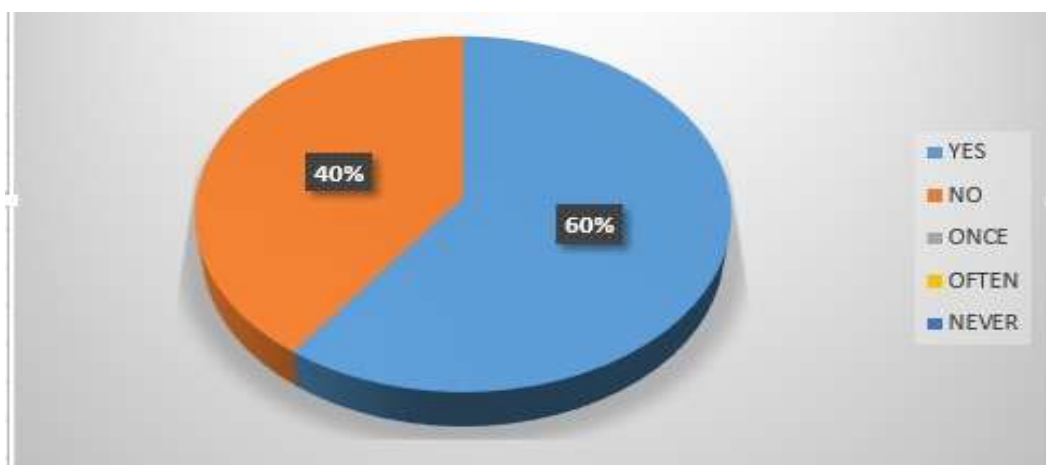
5.3 ANALYSIS

For the questionnaire, a complete goal with population of 30 were made; however, in the end, most effective of the 25 made it through and the consequences are given underneath

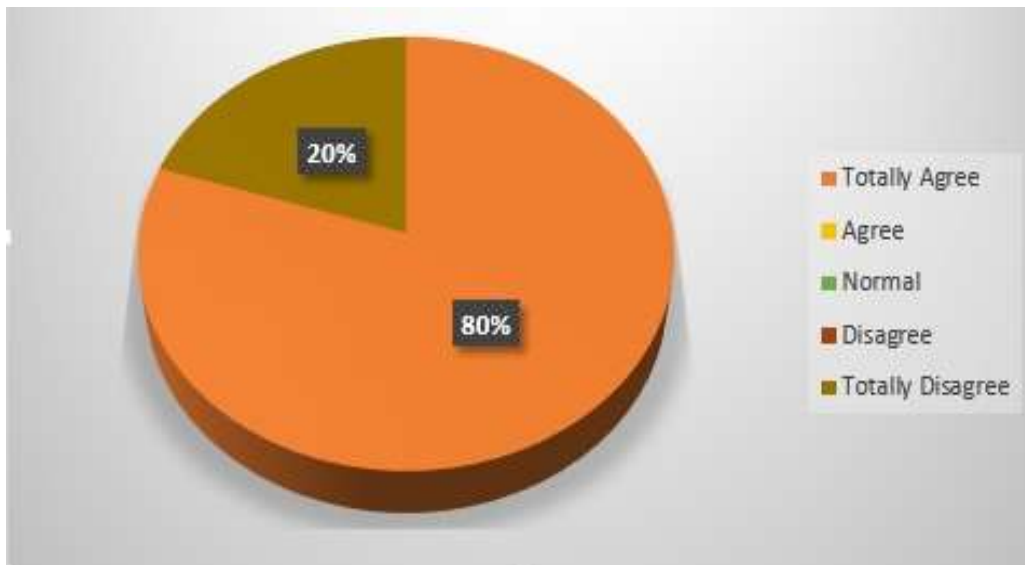
1. Have you ever used an online healthcare system before?



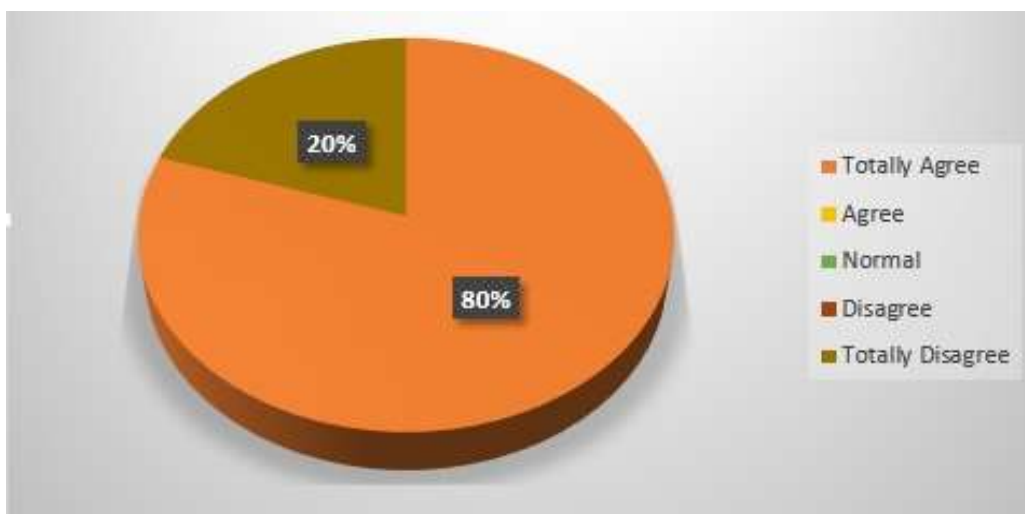
2. Have you ever used a system same big data in healthcare System?



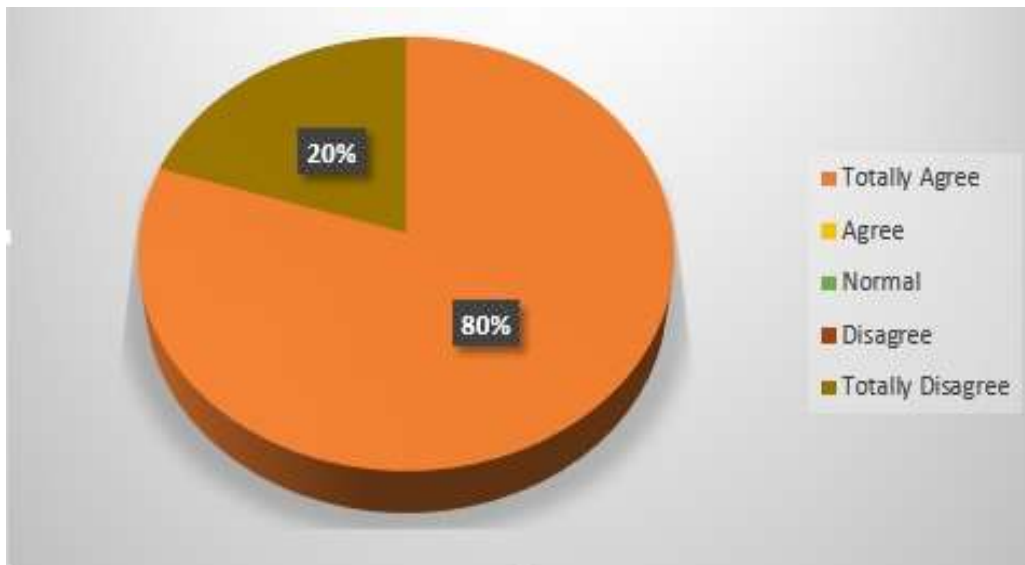
3. Do you think in Bangladesh there is a need for this kind of system in healthcare?



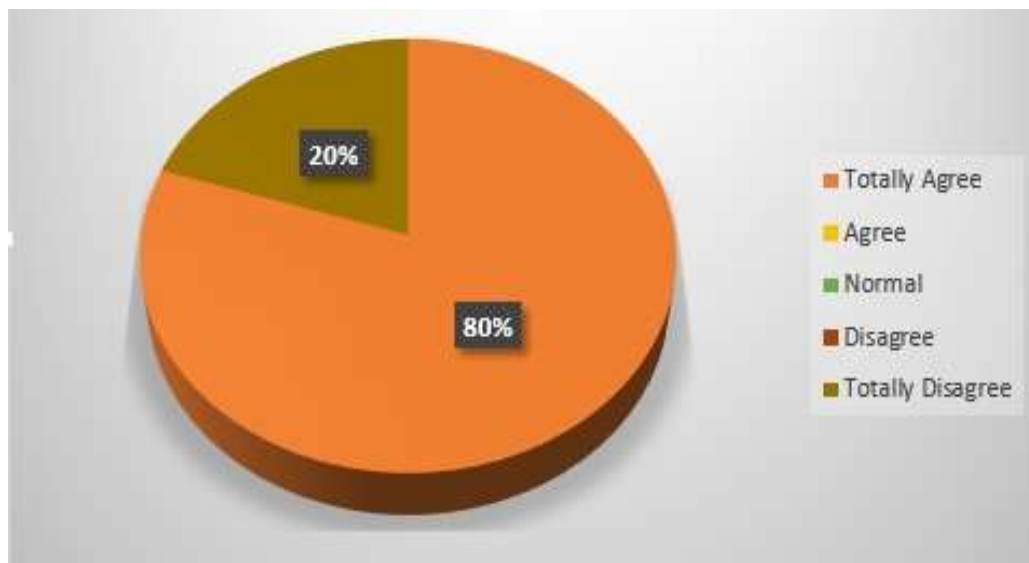
4. Regarding the cost do you consider it's strategic for any healthcare help to fund the growth and able to achieve the Big Data System in healthcare?



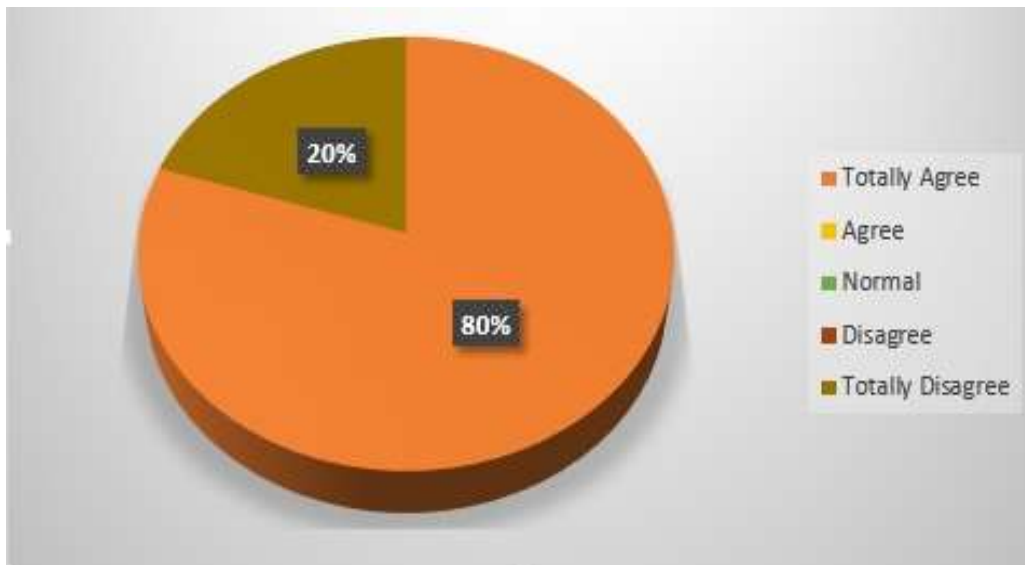
5. Regarding healthcare management, do you think implementing a system like Big Data in health care desirable?



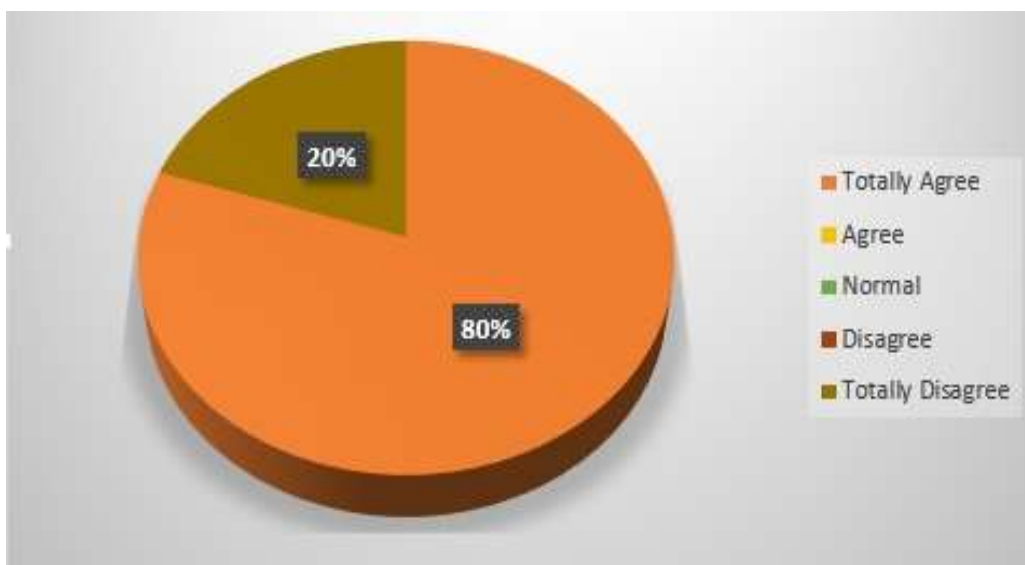
6. Do you think implementing a system like Big Data reduce the cost per head of our population?



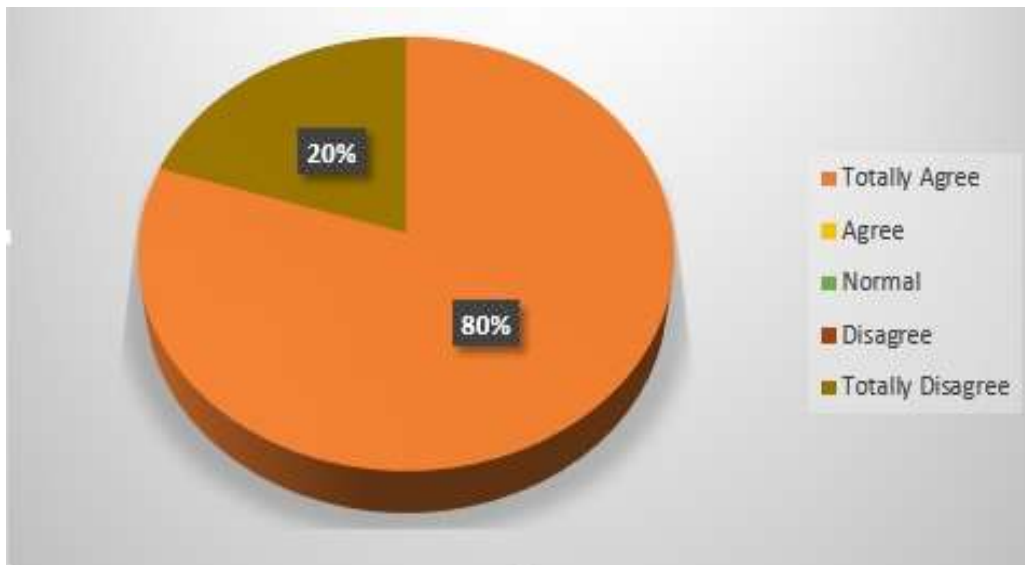
7. Do you think personnel face difficulties due to developing Big Data system in healthcare?



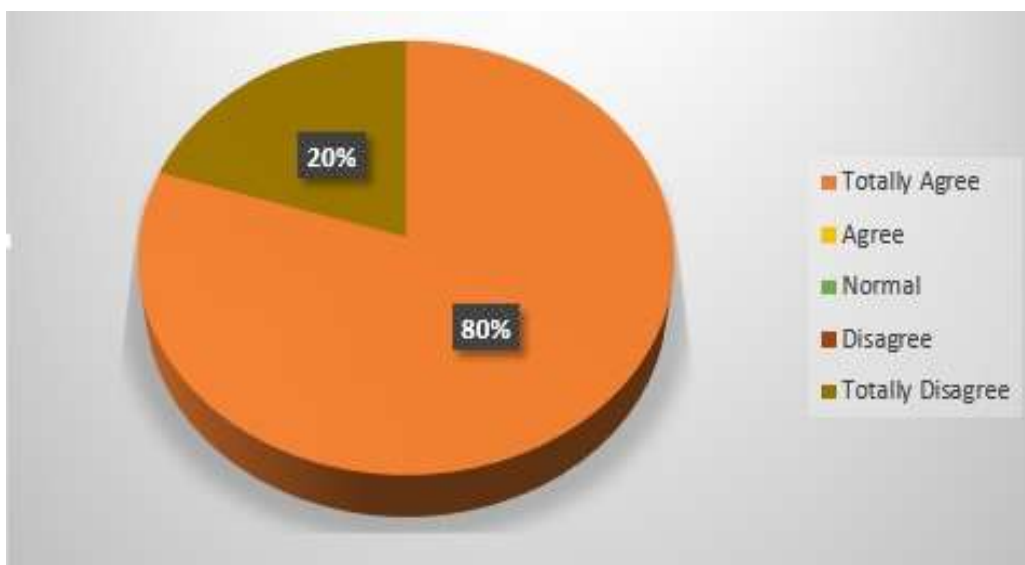
8. Do you think by implementing Big Data system our healthcare will get benefit?



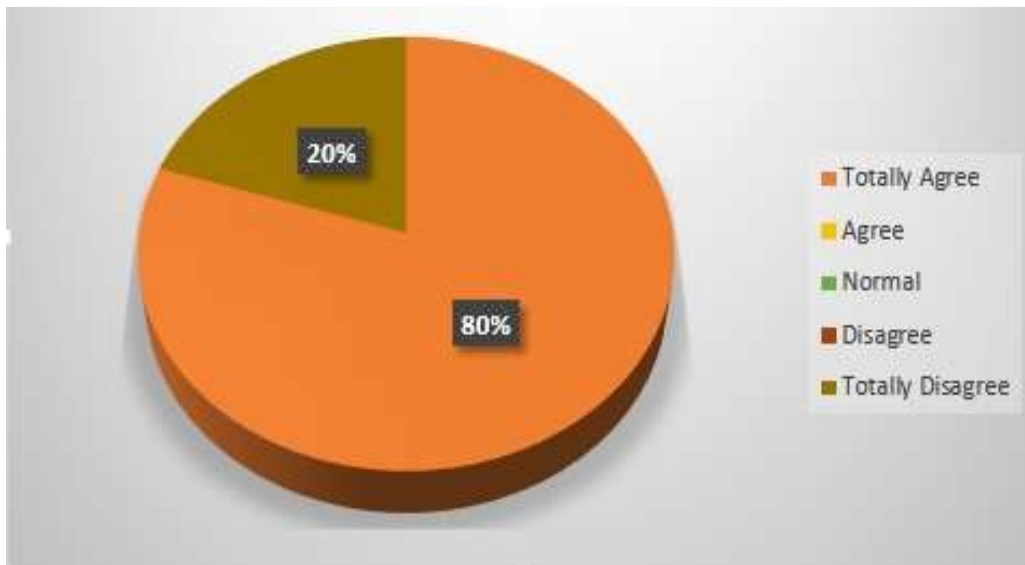
9. Do you think implementing Big Data system our healthcare will not get any benefit?



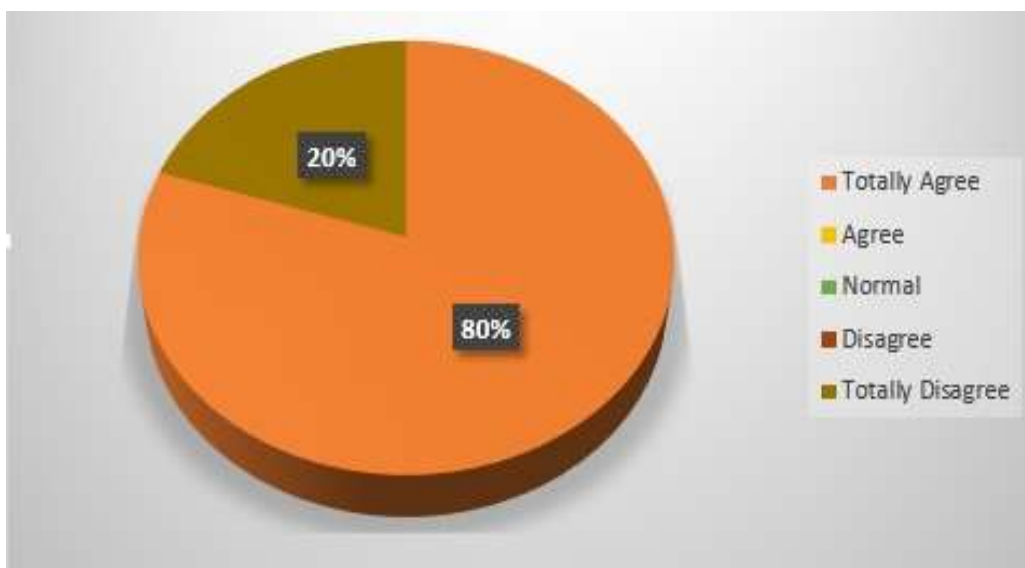
10. Do you think implementing a system like Big Data in our healthcare system makes it easier to manage healthcare general information?



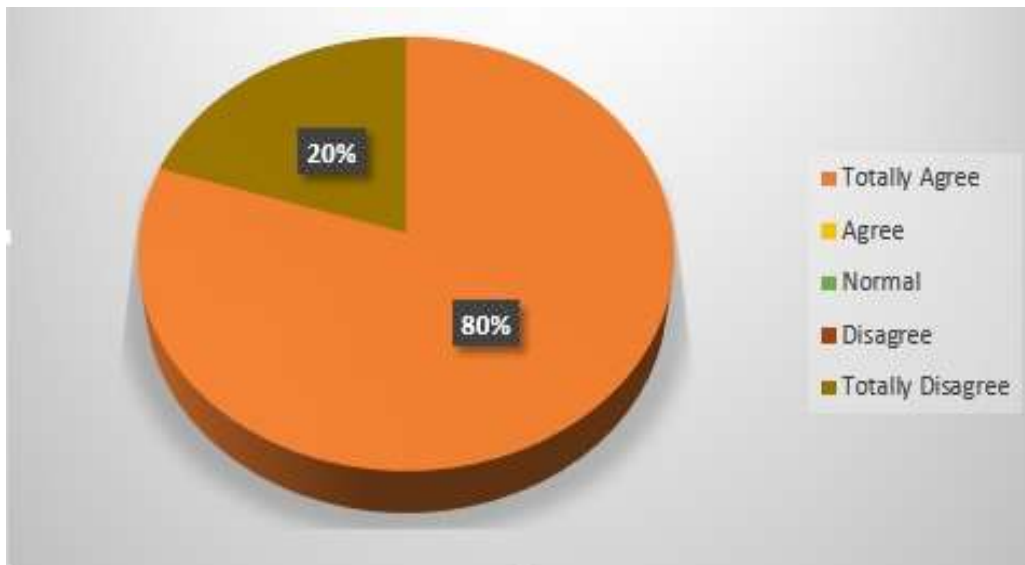
11. Do you think managing our healthcare general information become harder due to implementing big data system in healthcare?



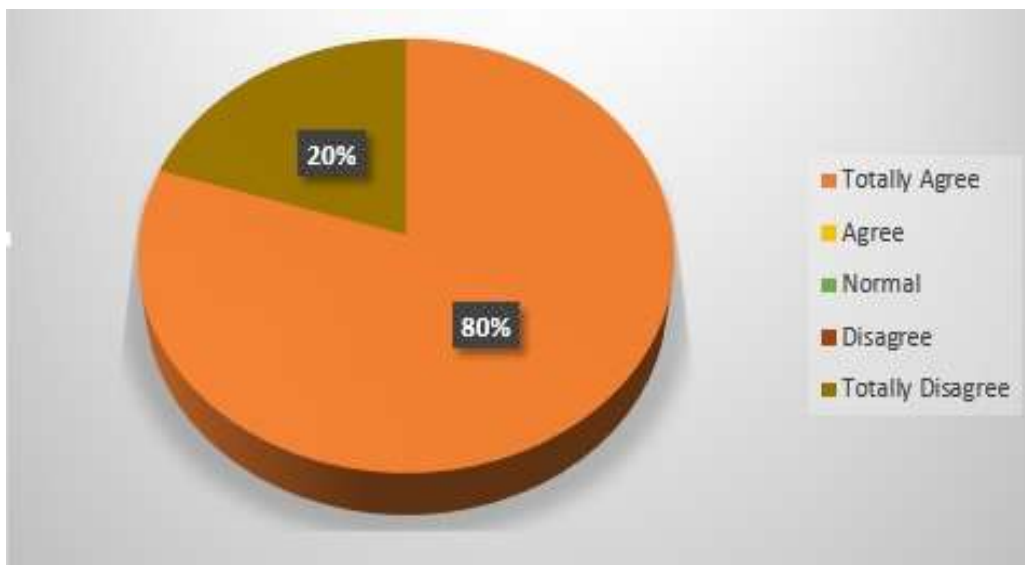
12. Do you think Big Data system is safe enough to handle information?



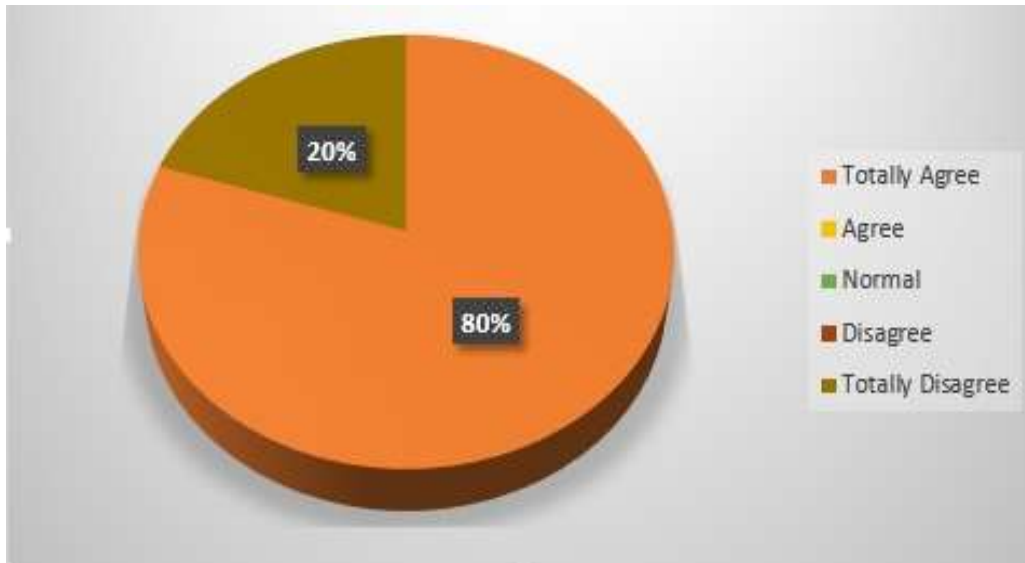
13. Do you think by implementing Big Data in our healthcare system will improve healthcare personnel performance?



14. Do you think personnel get more motivation due to implementing Big Data system?



15. What is your assumption regarding establish Big Data in healthcare system?



The analysis obtained from the comments is as follows

1. Approximately 60% of total populace have used an online device/mechanism earlier and remaining 40% have used it once. This means most participants are acquainted with the system.
2. As a minimum of total population have also used the Internet system, just like the advanced healthcare system, it confirms familiarity with such a system for more than half of the last populace who have used it once before
3. About 80% of overall populace agree and totally provide confirmation to the reality that a device which includes the superior healthcare system is a necessity across hospitals
4. 80% of total population agree and absolutely comply with the fact that it's strategic for any medical institution to fund the improvement and implementation of the advanced healthcare through the usage of huge statistics gadget
5. All the population agree and absolutely conform to the observation that imposing a device which includes superior healthcare through the usage of big information device is wise
6. All of the general population agree and absolutely conform to the reality that implementing a gadget such as superior healthcare through the use of big data gadget will make docs task much less complicated

7. 80% of general populace disagree and definitely disagree with the realization that enforcing a machine such as advanced healthcare through using massive data machine will make medical doctors' task loads burdensome
8. Overall populace agree and completely comply with the reality that imposing a gadget which includes advanced healthcare via using big records device can have a superb impact on other methods inside the hospital
9. 80% of total population disagree and absolutely disagree to the reality that implementing a machine which includes advanced healthcare through the usage of massive facts gadget could have a negative effect on different tactics inside the health facility
10. All population agree and definitely endorse the claim that implementing a machine which includes advanced healthcare through using large facts based device makes it less complicated to control health center general information
11. 80% of overall population disagree and definitely disagree to the reality that imposing a system inclusive of superior healthcare through the usage of large information gadget makes it tougher to manage a clinic's general facts
12. All populace agree and totally support to the truth that the gadget is securely sufficient to be applied thinking about the type of statistics it would take care of on a daily basis
13. All populace agree and definitely corroborate to the reality that enforcing a gadget along with superior healthcare through the usage of huge information gadget will have a boom on physicians' performance
14. All population agree and definitely consider the truth that implementing a system which includes superior healthcare through the use of massive data device will convey greater motivation for doctors and other hospital personnel
15. Approximately 70% of overall populace has expectation that the system needs to be easy; however, it is complete enough. 30% of the remaining population has expectation that the system should have functions that covers all medical doctors' procedures in a regular clinic.

5.4 INTERVIEW

The interview consultation occurred via Skype with Dr. Abdullah Al Maruf, Registrar, Dhaka Medical College and Hospital, Bangladesh and the list of query was dispatched to the correspondent. The details of the interview are given beneath:

Question: Can you explain Big Data in healthcare system based on the characteristics desired in the setting?

Answer: I see a number of capabilities as it is a fact system that could manipulate among other things, superior healthcare system, appointment and different consumer related tactics. So I expect the subsequent features to be essential:

- ✓ LOGIN
- ✓ LOGOUT
- ✓ USER REGISTRATION
- ✓ DOCTOR REGISTRATION
- ✓ ADD APPOINTMENT
- ✓ LAB BILLING
- ✓ DIAGNOSIS

It is probably more than this; all of it depends at the developer's preference. The developer's choice also ought to depend on the necessities of the system to be advanced.

Question: Can you summarize the best requirement to generate this system?

Answer: This could be quality responded from a developer's factors of consideration. User requirements define what any consumer of the device can do. This indicates one element: device capabilities. The stairs to generate person necessities may involve:

- ✓ Identify the lively customers
- ✓ Pick out passive customers
- ✓ Pick out information that each user could work with
- ✓ Convert each active user's facts utilization to requirement

- ✓ Convert passive customer's statistics usage into necessities
- ✓ Convert person requirement into system features

There are probably versions in the steps, but I agree with these indexed above paperwork the bedrock for generation of gadget necessities.

Question: Can you recommend an appropriate methodology for the advanced system?

Answer: In truth, there may be nothing like the proper technique, all of the developers desire to do is recognition on his requirements. System necessities have a manner of influencing the kind of method that could so as for the requirements to be met. There are plenty of system methodologies and right here are a few in concise paper works.

Dynamic System Development Model Methodology (DSDM): developed in the UK within the nineties, it is an evolution of rapid utility improvement exercise. Its energy lies inside the guide training that incorporates it as well as documentation strategies which has made it stand out among so many competitors. In keeping with affiliation of present day technology, DSDM is made from five most important ranges which can be:

1. Pre – project
2. Purposeful version
3. Design and construct
4. Put in force, deploy and keep
5. Publish – project – renovation

Extreme Programming Methodology (XP): The XP is a method that is used for growing software program within an unstable environment as it permits high flexibility inside the modeling method. It's made from 4 levels which might be:

1. Exploration segment
2. Planning phase
3. Iteration to release segment
4. Production section

Feature Driven Development Methodology (FDD): it has just sufficient techniques to ensure scalability and repeatability as it encourages creativity and innovation at some point of improvement. Feature driven improvement is made from four methods which are:

1. Develop a normal model

2. Build a characteristic list
3. Plan by characteristic
4. Layout and build by characteristic

Joint Application Development Methodology (JAD): That is a requirement-definition and person-interface design methodology in which end-users, executives, and builders attend intense off-website online conferences to work out a machine's info. Its aim is to contain the patron in the design and development of a utility. It's made from six ranges which might be"

1. Requirements
2. External design
3. Inner layout
4. Software development
5. Testing
6. Installation and preservation

Spiral Methodology: that is primarily based on the basis that software program development projects work pleasant when they're each incremental and iterative. The model has four levels:

1. Planning
2. Hazard evaluation
3. Engineering
4. Assessment

Waterfall: This methodology focuses more on the requirements and design being correct. It is mainly made up of five main phases namely:

1. Requirements
2. Design
3. Implementation
4. Verification
5. Maintenance

Question: Can you recommend an appropriate growing platform for the advanced system?

Answer: This is, if I am not wrong, refers to the programming language that can be used for the improvement of the proposed gadget. Once again, emphasis is on “appropriateness”. There is no such thing as appropriate programming language to increase a device but what desires to be considered are:

- ✓ The System requirements
- ✓ The consumer necessities
- ✓ Language libraries and API
- ✓ Language support

A number of programming languages are available and can be explored. Those are

- ✓ C
- ✓ C++
- ✓ C#
- ✓ JAVA
- ✓ VISUAL BASIC
- ✓ PHP
- ✓ RUBY

Question: Can you recommend an appropriate database for the storage of information for the advanced system?

Answer: simply as I responded for the programming language, there's no such aspect as “suitable database”. Each database has its very own power, in addition to limitations; however, maximum times, the database for use constantly has an excessive effect on the choice at the front give up as well and vice versa. This means the front ceases utility for use the database that goes with it. This is due to the fact that over time, these databases have been used with specific front ends and their problems bobbing up which were resolved over time. Using some combinations of databases and the front would just maintain to give troubles and problems without visible solutions.

The most user friendly databases are:

- ✓ MS SQL

- ✓ MYSQL
- ✓ ORACLE
- ✓ MONGO DB

Question: Can you recommend an appropriate structure for the advanced system?

Answer: There is no suitable framework but what I will endorse is that the technique that has been used to expand the device must be given a better appearance as all of it depends on developer's choice. These steps I would strongly advocate.

- ✓ Problem identification
- ✓ Feasibility look at
- ✓ Studies
- ✓ Information amassing and analysis
- ✓ Logical layout
- ✓ Bodily design
- ✓ Implementation and testing
- ✓ Integration
- ✓ Documentation

Question: Can you recognize feasible ultimatum that may be confronted in the operation of establishing the proposed system and how to solve them?

Answer: Normally if the entirety is going nicely with the development, there shouldn't be any drawbacks. But, one cannot expect what could occur at some point of improvement. Here are some well-known problems that might be encountered in the course of improvement; note that some problems are extraordinary to a few systems

- ❖ Unclear aim definition

No longer sincerely defining the desires and goals to be executed should lead to loss of corporation with the developmental group. Placing goals and goals genuinely on the beginning of any system development makes the whole lot easy and simple.

- ❖ Undeclared capabilities

Now not truly defining the features to be blanketed in the machine might clearly lead to specifications and requirements re-review some of times. This indicates the developmental crew might simply be biting around the bush.

❖ Unclear methodology

Now not simply identifying the developmental methodology to be implemented can purpose an extended delay and even confusion. This is because a methodology offers you a clear framework of the developmental tiers that needs to be fulfilled in the development of the machine

❖ Budget

Budget is probably low and sensible for the device to reach its complete ability. This means there could be breaks inside the execution of the challenge because it all relies upon on how cash flow in. this must be addressed proper from the start in an effort to avoid delays within the future.

❖ Dedicated workforce

Shortage of body of workers to dedicated time to work on the device. Lack of team of workers dedicated to the improvement of the gadget may be a real setback.

❖ Converting time

Time body might be too short for the system to be finished. There may be usually a want to feature more time for a task to be done. This is due to unforeseen circumstances that could arise in the course of the development of the machine which might cause some delays

❖ System testing and coding.

That is the most common trouble coding and debugging are something a developer cannot run away from. Codes might always give errors from time to time and this need to be welcome as it shows one is at the right song.

Question: Can you summarize the appropriate test plans for the proposed system?

Answer: A test plan can also be called test pushed improvement wherein a programmer growing a device test functionality, units, modules of a machine this is an international trendy for trying out evolved machine for each machine evolved, there are simple take a look at plans that must be executed. There are about 14 fundamental test plans that I'd advocate each gadget should go through. These are:

- ❖ **Black Box Text**
- ❖ **Acceptance Test**
- ❖ **Compatibility Test**
- ❖ **Unit Test**
- ❖ **White Box Test**
- ❖ **Globalization testing**
- ❖ **Integration Testing**
- ❖ **Performance Test**
- ❖ **Requirement Testing**
- ❖ **Security Test**
- ❖ **Smoke Test**
- ❖ **Usability Test**
- ❖ **Volume Test**
- ❖ **Vulnerability Test**

Question: Can you propose best surveillance evaluate for the proposed system?

Answer: protection has turned out to be an issue nowadays and there's an urge to any machine been deployed as soon as it is a web based totally device. the community the gadget might be carried out wishes to be secured, in addition to the gadget itself needs to be protection oriented so that it will hold the protection of the data and information it'd house. Security is a totally touchy domain and no person jokes with security specifically when it has to do with organizational information like that of institutions and faculties. I would advocate more than one security features just to be sure the gadget is safe sufficient:

- ❖ **Firewalls:**

I strongly recommended a firewall to prevent the network on which the machine could be located. The network has a server and different workstations as well. This prevents unauthorized external get right of entry to which could be very important.

❖ **Get admission to manage (login with integrated SMS notification):**

There's a want to segregate records into levels based totally on their significance. That is now reachable by using the person based at the get right of entry to right that has been assigned to the person which must be authenticated from a cell tool. That is a manner simply to make sure the actual consumer is accessing the right facts

❖ **Intrusion prevention competencies:**

I individually endorse intrusion prevention abilities that might assist preventing impersonation of personality. Nowadays, impersonation or using fake identity has now grown to be rampant and it is not an amazing thing for the industry.

❖ **Intrusion detection capabilities:**

Intrusion detection abilities might additionally save you from unauthorized admission in a way of trial and errors to prevent the statistics of the users in addition to the system statistics

Question: At the end, what type of outcome from this system?

Answer: I have no doubt that the final results of this system might be brilliant if advanced system will be able fully implement its greatest features. I would love to peer the system while it's completed because I have very excessive expectation

The analysis from the interview shows that

1. Capabilities including login, registration, data manipulation, managerial functionalities and reviews ought to be basic to a device along with the advanced healthcare system through the using of big data.
2. Person necessities is nicely generated from developers point of view and the steps encompass identifying the energetic customers, identifying passive users, identifying data that each consumer would work with, converting each active users' records utilization to

requirement, converting passive users data usage into requirements and converting consumer requirement into gadget features

3. There may be no suitable method for any gadget but consideration has to accept to the gadget and user requirements

4. There's no suitable programming language for any system but consideration has to accept to the system requirements, the user necessities, language libraries and API in addition to language assist

5. There is no appropriate database for a particular gadget; consideration has to receive to strengths and quandary of every database in addition to front stop integration and connectivity

6. There's no appropriate form of work but issues are given to deal with multiple steps to broaden one primarily based on developer's desire or attention, which include problem identification, feasibility study, records amassing and evaluation, logical layout, bodily design, implementation and checking out, integration and documentation

7. Possible threats to appearance out to encompass: unclear purpose definition, undeclared functions, doubtful method, price range, devoted body of workers, converting time and gadget coding and checking out

8. Of all the check available, five are the most critical at the preliminary degree that are: unit, module, black box, acceptance and safety

9. Security measures to don't forget consist of firewall integration; get admission to control, intrusion prevention, and intrusion detection and in all likelihood biometrics.

CHAPTER 8

CONCLUSION

In this paper, we provided superior advanced healthcare system as a project developed with apache HIVE, an abstraction of map lessens. The information what you are going to investigate is semi-structure information computerized AHCS. The system solved the problems associated with the present manual system. Protection is also enhanced considering the fact that access to the machine requires authentication. However, the system does no longer alert the pharmacy of the expiry date of drugs also, departments along with security and assets aren't protected within the design. Consequently, developing an AHCS which can alert the pharmacist of the expiry date of medication at a given time and manage all departments within the health facility might be appealing studies for coming days.

FUTURE ENHANCEMENTS

This research can be extended using cloud computing for portability of EHRs to all around the world for higher treatment anywhere each time without sporting past remedy file of person making it more fee powerful, well timed, efficient and paperless.

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